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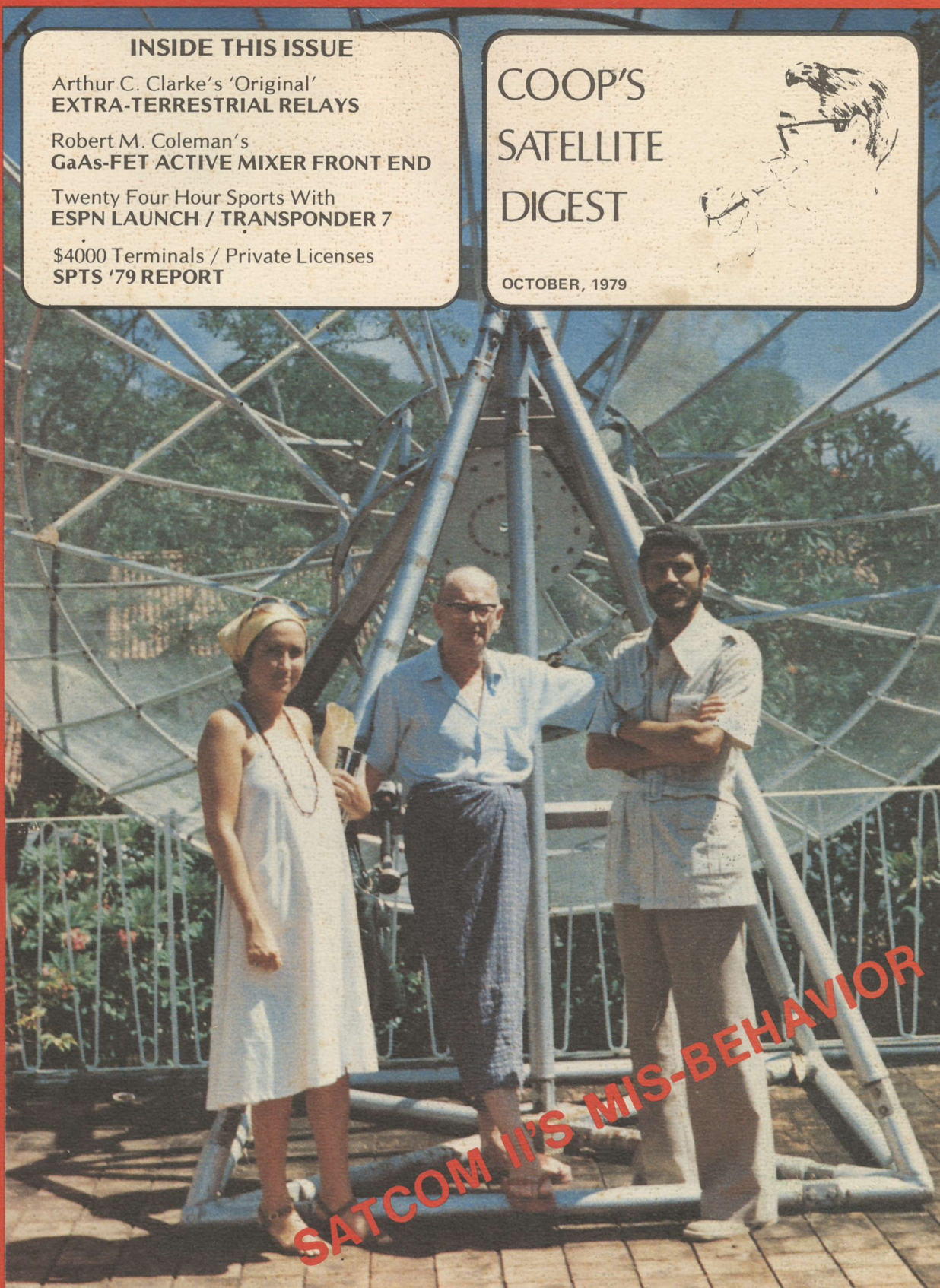
Twenty Four Hour Sports With
ESPN LAUNCH / TRANSPONDER 7

\$4000 Terminals / Private Licenses
SPTS '79 REPORT

**COOP'S
SATELLITE
DIGEST**



OCTOBER, 1979



SATCOM II'S MIS-BEHAVIOR

OLIVER SWAN-

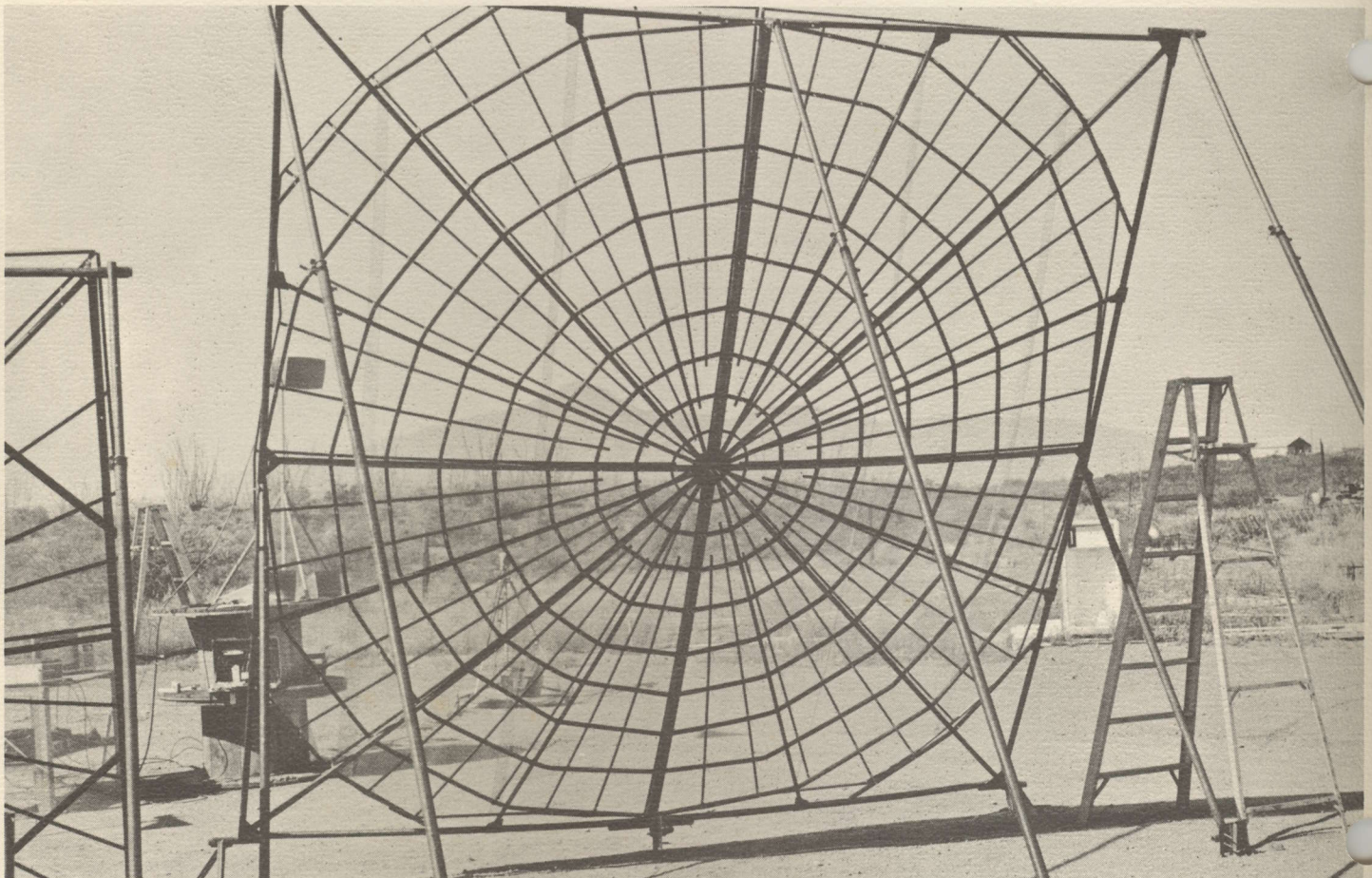
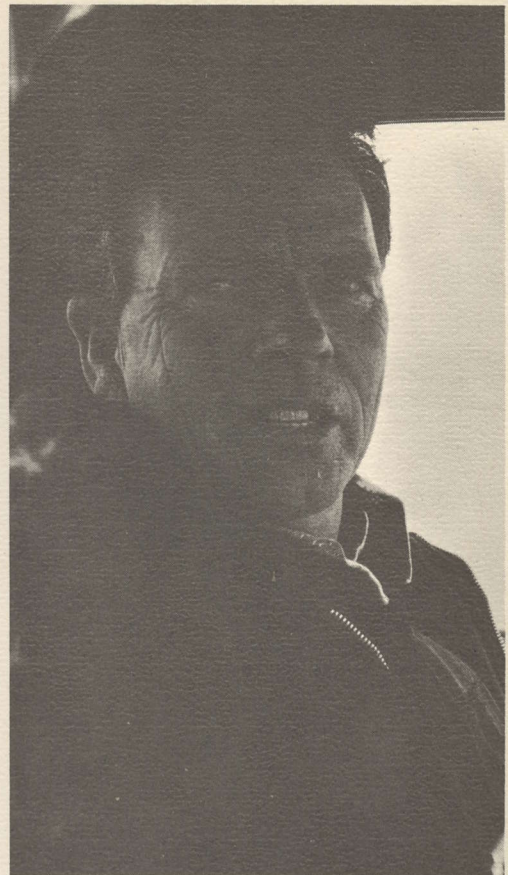
talks about Spherical TVRO antennas.

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COOP'S COMMENT ON TECHNOLOGY

SENSE OF HISTORY

To the 2,500 or so individuals and firms receiving this (first) issue of CSD, year's from now you may look back on the October 1979 issue of **Coop's Satellite Digest** and consider it to have been the 'beginning of a telecommunications era'. To 500 or so others, the 'private / low-cost satellite TV terminal' era may have begun at SPTS '79 held in Oklahoma City in mid-August of this year. To still others, my **TV GUIDE** article appearing in October of 1978 may have marked the 'turning point'.

It is more appropriate, if historians will one day trace the origins of satellite television, that we start at the very beginning. On our front cover this month we are particularly honored to have Arthur C. Clarke; the one individual who really began it all. Not in 1979 or 1978 but back in 1945!

Arthur C. Clarke is a truly unique individual in a world filled with unique individuals. On pages 2 through 5 here this month we present the published work that really **did start** the satellite revolution. Keen sighted readers will notice that we are reprinting from **WIRELESS WORLD** a Clarke article appearing in October of that year. Read it carefully. Consider as you read this origin's piece that Clarke was writing at the close of the Second World War; that anything above 100 MHz was considered black art, that artificial satellites were hardly even a concept, and that the rocketry required to launch such a system was not even contemplated. Not by anyone ... other than the extremely far-sighted Arthur C. Clarke.

Arthur C. Clarke, author, space visionary, lecturer, and underwater explorer and scientist. Clarke was a radar instructor for the RAF during 1945. He subsequently was a technical officer for the first GCA (Ground Controlled Approach) system in the world and in 1948 he received a B.Sc. in Physics (Pure and Applied Maths) from King's College in London. Today Arthur C. Clarke resides in Colombo, Sri Lanka where he has headquartered while engaged in underwater exploration of the coast of Sri Lanka (Ceylon) and from which he engaged in numerous trips to the Great Barrier Reef in Australia since 1954 for additional underwater exploration.

On our front cover Arthur C. Clarke (in the middle) is standing before a 15 foot screen-mesh parabolic which was presented to him in Colombo as a gift of the Indian Government during the Indian 1976 SITE experiments on 860 MHz. During this ATS-6 experimental program Clarke was able, some thirty years after he first hypothesized geostationary satellites, to witness first-hand the operation of such a system. You may recognize Clarke's name from other abilities this multi-talented individual has developed. His writings, in non-fiction and fiction areas, have been prolific. With Stanley Kubrick Clarke authored **2001: Space Odyssey**. From his own hand has come more than 50 others including **Tale of Ten Worlds**, **The Lion of Commarre**, **The Lost Worlds of 2001**, **Expedition to Earth** and (with the astronauts) **First On The Moon**.

Arthur C. Clarke is quite a guy. And I wanted to set the record straight, from the very beginning. Read our first feature here this month and remember as you do that it was the very imaginative and fertile mind of Arthur C. Clarke, **back in 1945**, that really started all of this geostationary satellite business!

ENGINEERS WILL BE ENGINEERS

H. Taylor Howard is a modern day Arthur C. Clarke. Tay's work in developing the first privately created and funded operational TVRO receiving terminal in the summer of 1976 is a matter of record. His professional work at Stanford University is, in his field, legendary. Tay observes that **"engineers will do things because they are engineers and because they consider a project 'do-able'"**. In short, an engineer 'challenged' by a concept will tackle a project for no reason other than the challenge that it presents.

Taylor, H. Paul Shuch, John Bacon from HOMESAT and Mike Fornicari of DEXCEL participated in a panel on low cost, private (TVRO) terminals during the Western Electronics Convention (WESCON) in mid September in San Francisco. WESCON always draws a big crowd because it is a superb new-technology exhibit but its sessions, where one goes to sit down and learn, are usually sparsely attended. **This session broke all records**; a room capable of seating 350 was filled with more than 500 and people stood in the aisles and out the doors. Much of the 3 hour plus session centered on a non-engineering matter; the legality of receiving satellite signals on a private basis. HOMESAT's Bacon noted that his firm wants users to be legally entitled to receive what they look at, but noted **"we favor de-regulation of licensing"**. Taylor brought the house down with his off-hand observation that Section 605 may end up in the Supreme Court since many feel that 'personal benefit' only occurs when the users receives money or something of value from the 'interception of a transmission'; and noting that many people feel **"as long as those photons are falling on my ground they (the satellite operators) can damn well keep them off my head if they don't want me using them!"**.

Hundreds of new enthusiasts were turned onto satellite TV by the Shuch created WESCON panel and since virtually all were engineers we must observe that since engineers will continue to be engineers, new developments in the technology side of the equation are probably already being created in workshops across the country. **There is no stopping this technology revolution!**

CSD
TECHNOLOGY



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EXTRA-TERRESTRIAL RELAYS

Can Rocket Stations Give World-wide Radio Coverage?

By ARTHUR C. CLARKE

ALTHOUGH it is possible, by a suitable choice of frequencies and routes, to provide telephony circuits between any two points or regions of the earth for a large part of the time, long-distance communication is greatly hampered by the peculiarities of the ionosphere, and there are even occasions when it may be impossible. A true broadcast service, giving constant field strength at all times over the whole globe would be invaluable, not to say indispensable, in a world society.

Unsatisfactory though the telephony and telegraph position is, that of television is far worse, since ionospheric transmission cannot be employed at all. The service area of a television station, even on a very good site, is only about a hundred miles across. To cover a small country such as Great Britain would require a network of transmitters, connected by coaxial lines, waveguides or VHF relay links. A recent theoretical study¹ has shown that such a system would require repeaters at intervals of fifty miles or less. A system of this kind could provide television coverage, at a very considerable cost, over the whole of a small country. It would be out of the question to provide a large continent with such a service, and only the main centres of population could be included in the network.

The problem is equally serious when an attempt is made to link television services in different parts of the globe. A relay chain several thousand miles long would cost millions, and transoceanic services would still be impossible. Similar considerations apply to the provision of wide-band frequency modulation and other services, such as high-speed facsimile which are by their nature restricted to the ultra-high-frequencies.

Many may consider the solution proposed in this discussion too far-fetched to be taken very seriously. Such an attitude is unreasonable, as everything envisaged here is a

logical extension of developments in the last ten years—in particular the perfection of the long-range rocket of which V2 was the prototype. While this article was being written, it was announced that the Germans were considering a similar project, which they believed possible within fifty to a hundred years.

Before proceeding further, it is necessary to discuss briefly certain fundamental laws of rocket propulsion and "astronautics." A rocket which achieved a sufficiently great speed in flight outside the earth's atmosphere would never return. This "orbital" velocity is 8 km per sec. (5 miles per sec), and a rocket which attained it would become an artificial satellite, circling the world for ever with no expenditure of power—a second moon, in fact.

the atmosphere and left to broadcast scientific information back to the earth. A little later, manned rockets will be able to make similar flights with sufficient excess power to break the orbit and return to earth.

There are an infinite number of possible stable orbits, circular and elliptical, in which a rocket would remain if the initial conditions were correct. The velocity of 8 km/sec. applies only to the closest possible orbit, one just outside the atmosphere, and the period of revolution would be about 90 minutes. As the radius of the orbit increases the velocity decreases, since gravity is diminishing and less centrifugal force is needed to balance it. Fig. 1 shows this graphically. The moon, of course, is a particular case and would lie on the curves of Fig. 1 if they were produced. The proposed German space-stations

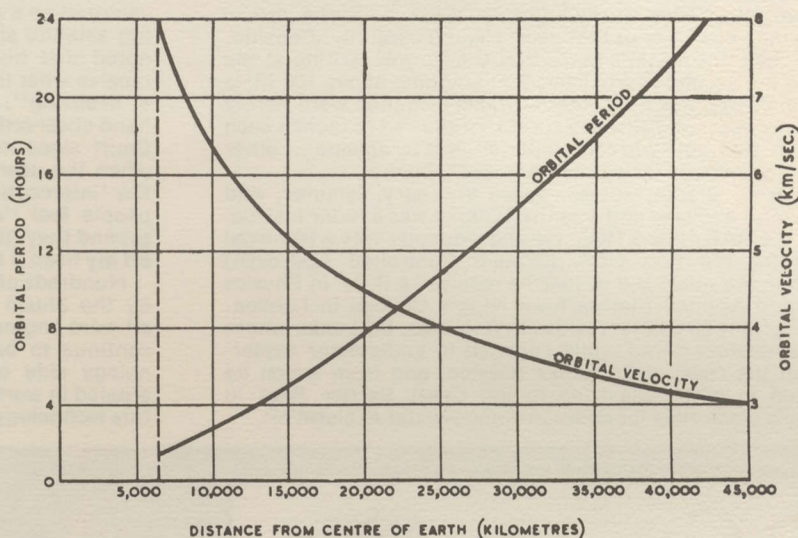


Fig. 1. Variation of orbital period and velocity with distance from the centre of the earth.

The German transatlantic rocket Aro would have reached more than half this velocity.

It will be possible in a few more years to build radio controlled rockets which can be steered into such orbits beyond the limits of

would have a period of about four and a half hours.

It will be observed that one orbit, with a radius of 42,000 km, has a period of exactly 24 hours. A body in such an orbit, if its plane coincided with that of the

Extra-terrestrial Relays—

earth's equator, would revolve with the earth and would thus be stationary above the same spot on the planet. It would remain fixed in the sky of a whole hemisphere and unlike all other heavenly bodies would neither rise nor set. A body in a smaller orbit would revolve more quickly than the earth and so would rise in the west, as indeed happens with the inner moon of Mars.

Using material ferried up by rockets, it would be possible to construct a "space-station" in such an orbit. The station could be provided with living quarters, laboratories and everything needed for the comfort of its crew, who would be relieved and provisioned by a regular rocket service. This project might be undertaken for purely scientific reasons as it would contribute enormously to our knowledge of astronomy, physics and meteorology. A good deal of literature has already been written on the subject.²

Although such an undertaking may seem fantastic, it requires

Fig. 2. Typical extra-terrestrial relay services. Transmission from A being relayed to point B and area C; transmission from D being relayed to whole hemisphere.

for its fulfilment rockets only twice as fast as those already in the design stage. Since the gravitational stresses involved in the structure are negligible, only the very lightest materials would be necessary and the station could be as large as required.

Let us now suppose that such a station were built in this orbit. It could be provided with receiving and transmitting equipment (the problem of power will be discussed later) and could act as a repeater to relay transmissions between any two points on the hemisphere beneath, using any frequency which will penetrate the ionosphere. If directive arrays were used, the power require-

ments would be very small, as direct line of sight transmission would be used. There is the further important point that arrays on the earth, once set up, could remain fixed indefinitely.

Moreover, a transmission received from any point on the hemisphere could be broadcast to the whole of the visible face of

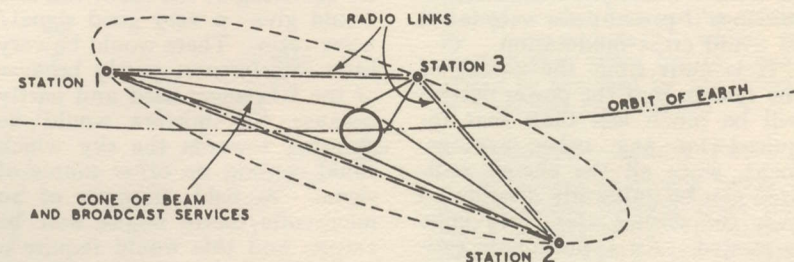


Fig. 3. Three satellite stations would ensure complete coverage of the globe.

the globe, and thus the requirements of all possible services would be met (Fig. 2).

It may be argued that we have as yet no direct evidence of radio waves passing between the surface

necessary evidence by exploring for echoes from the moon. In the meantime we have visual evidence that frequencies at the optical end of the spectrum pass through with little absorption except at certain frequencies at which resonance effects occur. Medium high frequencies go through the E layer twice to be reflected from the F

layer and echoes have been received from meteors in or above the F layer. It seems fairly certain that frequencies from, say, 50 Mc/s to 100,000 Mc/s could be used without undue absorption in the atmosphere or the ionosphere.

A single station could only provide coverage to half the globe, and for a world service three would be required, though more could be readily utilised. Fig. 3 shows the simplest arrangement. The stations would be arranged approximately equidistantly around the earth, and the following longitudes appear to be suitable:—

- 30 E—Africa and Europe.
- 150 E—China and Oceania.
- 90 W—The Americas.

The stations in the chain would be linked by radio or optical beams, and thus any conceivable beam or broadcast service could be provided.

The technical problems involved in the design of such stations are extremely interesting,³ but only a few can be gone into here. Batteries of parabolic reflectors would be provided, of apertures depending on the frequencies employed. Assuming the use of 3,000 Mc/s waves, mirrors about a metre across would beam almost all the power on to the earth. Larger reflectors could be used to illuminate single countries or regions for the more restricted services, with con-

of the earth and outer space; all we can say with certainty is that the shorter wavelengths are not reflected back to the earth. Direct evidence of field strength above the earth's atmosphere could be obtained by V2 rocket technique, and it is to be hoped that someone will do something about this soon as there must be quite a surplus stock somewhere! Alternatively, given sufficient transmitting power, we might obtain the

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sequent economy of power. On the higher frequencies it is not difficult to produce beams less than a degree in width, and, as mentioned before, there would be no physical limitations on the size of the mirrors. (From the space station, the disc of the earth would be a little over 17 degrees across). The same mirrors could be used for many different transmissions if precautions were taken to avoid cross modulation.

It is clear from the nature of the system that the power needed will be much less than that required for any other arrangement, since all the energy radiated can be uniformly distributed over the service area, and none is wasted. An approximate estimate of the power required for the broadcast service from a single station can be made as follows:—

The field strength in the equatorial plane of a $\lambda/2$ dipole in free space at a distance of d metres is

$$e = 6.85 \frac{\sqrt{P}}{d} \text{ volts/metre, where}$$

P is the power radiated in watts.

Taking d as 42,000 km (effectively it would be less), we have

$P = 37.6 e^2$ watts. (e now in $\mu\text{V/metre}$.)

If we assume e to be 50 microvolts/metre, which is the F.C.C. standard for frequency modulation, P will be 94 kW. This is the power required for a single dipole, and not an array which would

concentrate all the power on the earth. Such an array would have a gain over a simple dipole of about 80. The power required for the broadcast service would thus be about 1.2 kW.

Ridiculously small though it is, this figure is probably much too generous. Small parabolas about a foot in diameter would be used for receiving at the earth end and would give a very good signal/noise ratio. There would be very little interference, partly because of the frequency used and partly because the mirrors would be pointing towards the sky which could contain no other source of signal. A field strength of 10 microvolts/metre might well be ample, and this would require a transmitter output of only 50 watts.

When it is remembered that these figures relate to the broadcast service, the efficiency of the system will be realised. The point-to-point beam transmissions might need powers of only 10 watts or so. These figures, of course, would need correction for ionospheric and atmospheric absorption, but that would be quite small over most of the band. The slight falling off in field strength due to this cause towards the edge of the service area could be readily corrected by a non-uniform radiator.

The efficiency of the system is strikingly revealed when we consider that the London Television

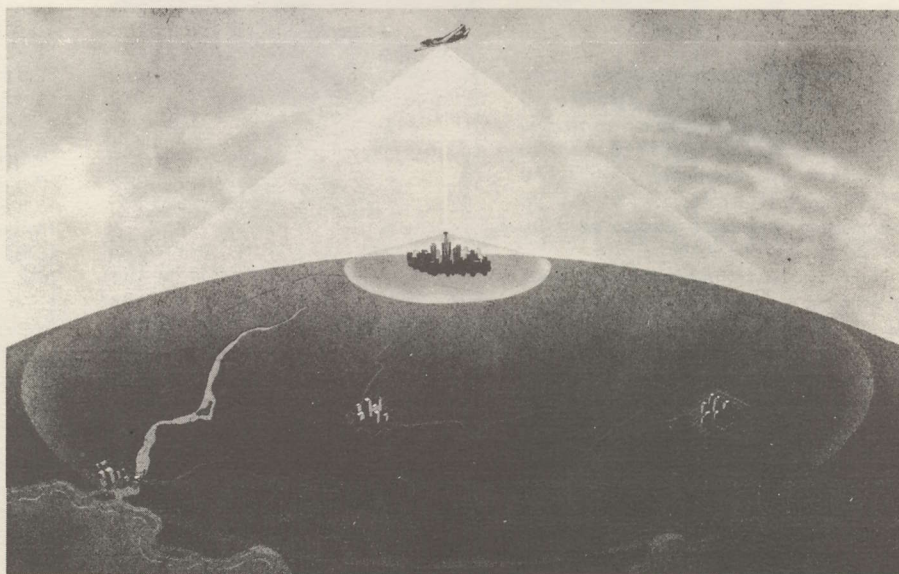
service required about 3 kW average power for an area less than fifty miles in radius.⁵

A second fundamental problem is the provision of electrical energy to run the large number of transmitters required for the different services. In space beyond the atmosphere, a square metre normal to the solar radiation intercepts 1.35 kW of energy.⁶ Solar engines have already been devised for terrestrial use and are an economic proposition in tropical countries. They employ mirrors to concentrate sunlight on the boiler of a low-pressure steam engine. Although this arrangement is not very efficient it could be made much more so in space where the operating components are in a vacuum, the radiation is intense and continuous, and the low-temperature end of the cycle could be not far from absolute zero. Thermo-electric and photo-electric developments may make it possible to utilise the solar energy more directly.

Though there is no limit to the size of the mirrors that could be built, one fifty metres in radius would intercept over 10,000 kW and at least a quarter of this energy should be available for use.

The station would be in continuous sunlight except for some weeks around the equinoxes, when it would enter the earth's shadow for a few minutes every day. Fig. 4 shows the state of affairs during the eclipse period. For

A project which goes part of the way towards the goal envisaged in this article has been put forward by Westinghouse in collaboration with the Glen L. Martin Co. of America. The radius of coverage would be increased from 50 to 211 miles by beamed radiation from an aircraft flying at a height of 30,000 ft. and equipped with television and FM transmitters.



Extra-terrestrial Relays—

this calculation, it is legitimate to consider the earth as fixed and the sun as moving round it. The station would graze the earth's shadow at A, on the last day in February. Every day, as it made its diurnal revolution, it would cut more deeply into the shadow, undergoing its period of maxi-

channels would be available.

(3) The power requirements are extremely small since the efficiency of "illumination" will be almost 100 per cent. Moreover, the cost of the power would be very low.

(4) However great the initial expense, it would only be a fraction of that required for the

ever, owing to its finite acceleration, the rocket loses velocity as a result of gravitational retardation. If its acceleration (assumed constant) is a metres/sec.², then the necessary ratio R_0 is increased to

$$R_0 = R \frac{a + g}{a}$$

For an automatically controlled rocket a would be about $5g$ and so the necessary R would be 37 to 1. Such ratios cannot be realised with a single rocket but can be attained by "step-rockets"², while very much higher ratios (up to 1,000 to 1) can be achieved by the principle of "cellular construction"³.

Epilogue—Atomic Power

The advent of atomic power has at one bound brought space travel half a century nearer. It seems unlikely that we will have to wait as much as twenty years before atomic-powered rockets are developed, and such rockets could reach even the remoter planets with a fantastically small fuel/mass ratio—only a few per cent. The equations developed in the appendix still hold, but v will be increased by a factor of about a thousand.

In view of these facts, it appears hardly worth while to expend much effort on the building of long-distance relay chains. Even the local networks which will soon be under construction may have a working life of only 20-30 years.

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- ¹ "Radio-Relay Systems," C. W. Hansell. *Proc. I.R.E.*, Vol 33, March, 1945.
- ² "Rockets," Willy Ley. (Viking Press, N.Y.)
- ³ "Das Problem der Befahrung des Weltraums," Hermann Noordung.
- ⁴ "Frequency Modulation," A. Hund. (McGraw Hill.)
- ⁵ "London Television Service," MacNamara and Birkinshaw. *J.I.E.E.*, Dec., 1938.
- ⁶ "The Sun," C. G. Abbot. (Appleton-Century Co.)
- ⁷ *Journal of the British Interplanetary Society*, Jan., 1939.

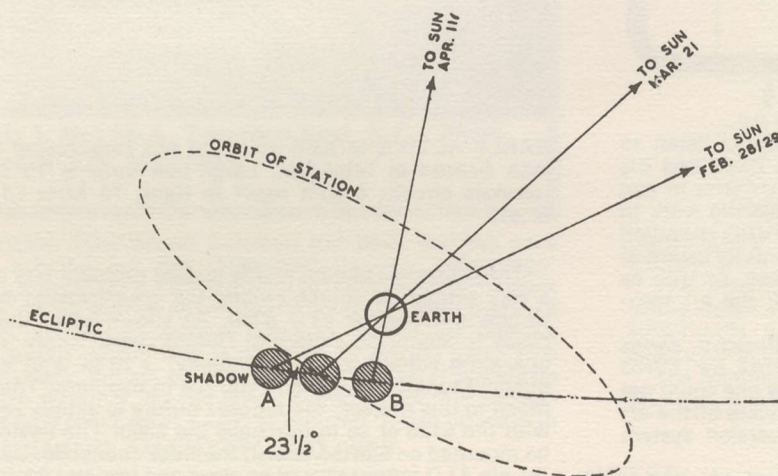


Fig. 4. Solar radiation would be cut off for a short period each day at the equinoxes.

mum eclipse on March 21st. on that day it would only be in darkness for 1 hour 9 minutes. From then onwards the period of eclipse would shorten, and after April 11th (B) the station would be in continuous sunlight again until the same thing happened six months later at the autumn equinox, between September 12th and October 14th. The total period of darkness would be about two days per year, and as the longest period of eclipse would be little more than an hour there should be no difficulty in storing enough power for an uninterrupted service.

Conclusion

Briefly summarised, the advantages of the space station are as follows:—

(1) It is the only way in which true world coverage can be achieved for all possible types of service.

(2) It permits unrestricted use of a band at least 100,000 Mc/s wide, and with the use of beams an almost unlimited number of

world networks replaced, and the running costs would be incomparably less.

Appendix—Rocket Design

The development of rockets sufficiently powerful to reach "orbital" and even "escape" velocity is now only a matter of years. The following figures may be of interest in this connection.

The rocket has to acquire a final velocity of 8 km/sec. Allowing 2 km/sec. for navigational corrections and air resistance loss (this is legitimate as all space-rockets will be launched from very high country) gives a total velocity needed of 10 km/sec. The fundamental equation of rocket motion is²

$$V = v \log_e R$$

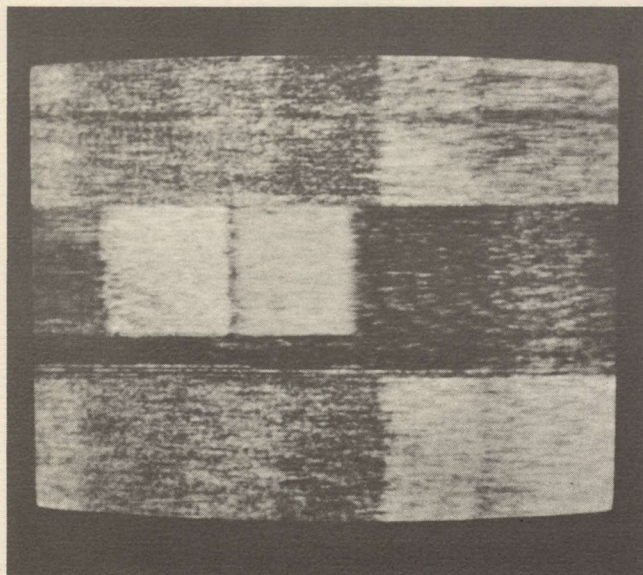
where V is the final velocity of the rocket, v the exhaust velocity and R the ratio of initial mass to final mass (payload plus structure). So far v has been about 2-2.5 km/sec for liquid fuel rockets but new designs and fuels will permit of considerably higher figures. (Oxy-hydrogen fuel has a theoretical exhaust velocity of 5.2 km/sec and more powerful combinations are known.) If we assume v to be 3.3 km/sec, R will be 20 to 1. How-

COLEMAN TERMINAL UPDATE

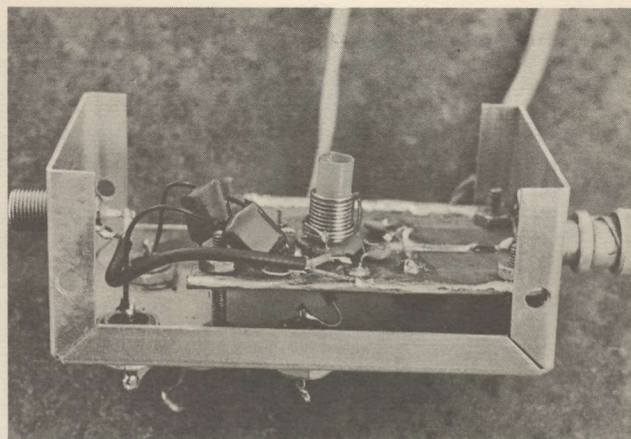
Attendees at SPTS '79 had the opportunity to listen to Robert M. Coleman of South Carolina as he described his work with an active mixer for the front end of a 4 GHz in and 70 MHz out down converter. Coleman's pioneering work in making the surplus work horse TD-2 play for TVRO reception is of course well known. Robert is however painfully aware of the shortage of TD-2 pieces on the marketplace, as well as being concerned that the TD-2 is not state of the art technology anymore.

Pleased with his success with Hewlett Packard series GaAs-FET devices in one and two stages LNAs for TVRO reception, Robert set out to determine just how one could get down to his standard 70 MHz i.f. using a state-of-the-art approach to the now established single conversion system popularized by the TD-2.

One of the first problems tackled, and solved, was a replacement for the LO (local oscillator) which he had originally pressed into service for his TD-2. As difficult as the TD-2 has become to find, the 3.630 to 4.130 GHz range LO source is even more of a problem. In the original Coleman terminal this was a Hewlett Packard TS-403 surplus (CW) signal generator. Not only are signal generators in this range difficult to find, they employ a klystron tube which at best is apt to be short lived and after failure almost impossible to replace.



ACTIVE MIXER RECEPTION - reception through Robert Coleman's active mixer without LNA in front of down conversion system. See warning about LO re-radiation here.

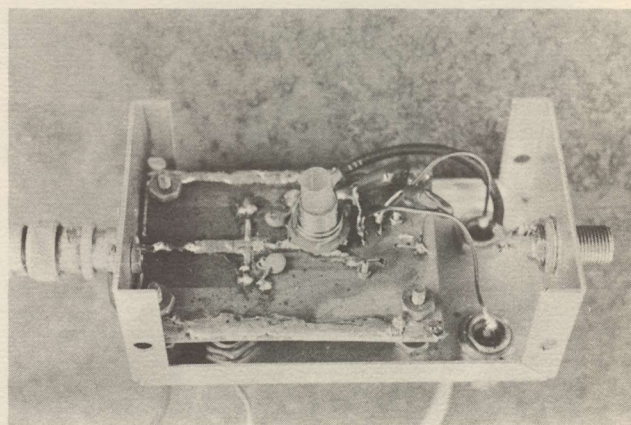


EARLY ACTIVE MIXER designed and constructed by Coleman housed in Mini-Box. Large coil form is 70 MHz i.f. resonant circuit; 4 GHz input to right, 70 MHz i.f. output to left.

The Coleman solution to this instant problem was to design a very simple LO source around the pre-packaged and ready to operate Avantek VTO 8360. As shown here, the 8360 is ready to mount on a piece of Duroid board; apply +15 volts operating voltage and a (nominally) +10 to +20 VDC (frequency) tuning voltage and you are in business. There is not much to this project; the biggest hurdle is simply coming up with the \$125 or so to purchase the 8360! The device should be mounted on Duroid board, the inter-connection cable from the pin 4 LO output should be short and low loss 50 ohm cable (if you could mount the VCO directly to the input connector on the TD-2 you would be even better off by using N to N or BNC to N adapter fittings). The tuning voltage should be regulated.

Having easily replaced the TS-403 LO source, the next trick was to look at making the TD-2 mixer a better performing system. The twin diodes used in the TD-2 are several generations 'back' and the performance (i.e. noise figure or conversion loss) of the TD-2 mixer is frightful at best; 12 to 15 dB would not be uncommon.

During SPTS '79 H. Paul Shuch suggested a double-balanced, GaAs-FET mixer scheme; something Paul is reported to be presently working on. The advantages to a doubly balanced mixer using active devices would be



ACTIVE MIXER must be constructed on Duroid board to insure that 4 GHz signals are not eaten up in circuit losses found in normal (lower frequency) circuit board material.

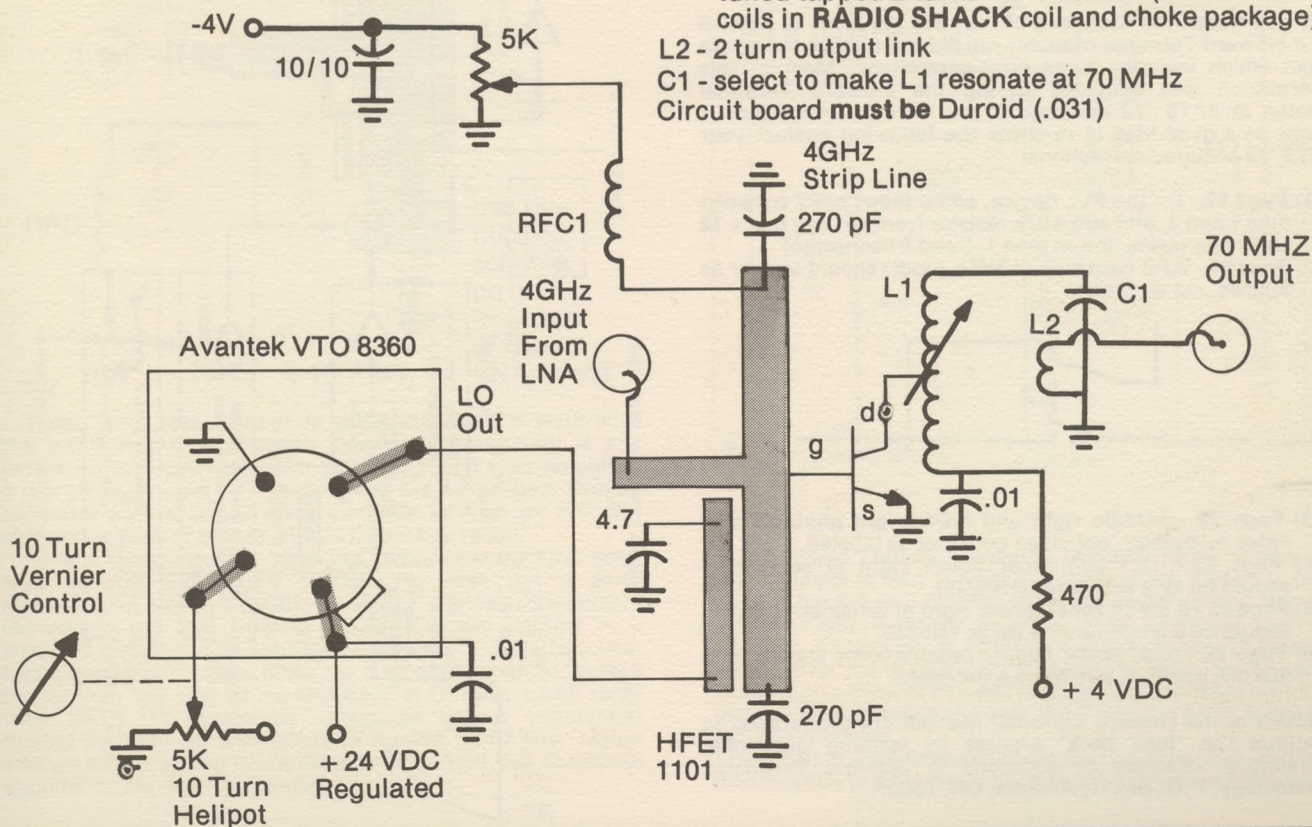
WARNING AND BOARDS

Feeding the AvanteK 8360 VTO local oscillator source directly into a mixer which is directly coupled to the feed antenna (i.e. without an LNA) is a good way to turn your ten foot dish into an unlicensed transmitting station capable of inflicting serious interference to other 4 GHz receiving systems in the area. A +10 dBm LO source fed back to a 10 foot dish can create an ERP in the 50 to 100 watt region at 4 GHz. **ALWAYS isolate the mixer from the feed with a minimum of one LNA stage and two is even safer.**

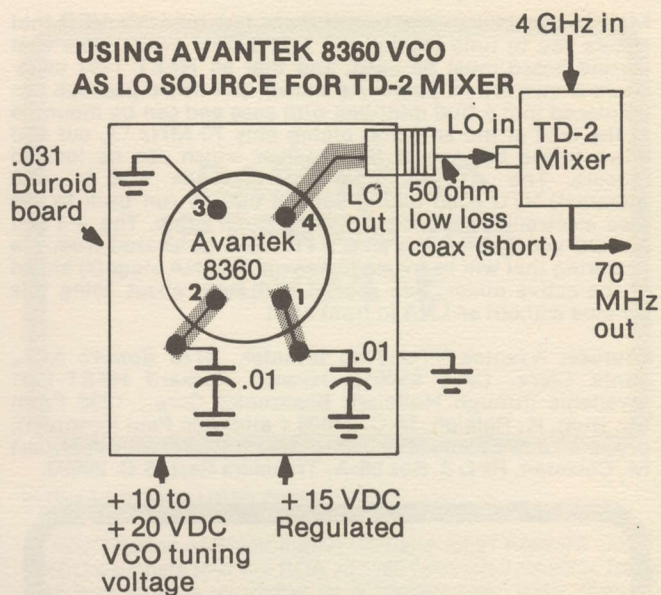
Duriod board circuit boards for this active mixer are available from: Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690. Price is \$25 per board.

considerable. TD-2 expert Coleman has been working on a similar scheme but has developed 'interim technology' around a single GaAs-FET (HFET 1101) device from Hewlett Packard. In an active mixer, when properly designed and operated, the mixing process becomes part of the positive gain equation; mixing loss is replaced by mixing gain. This has a dramatic impact on the S to N and C to N equations for a given terminal. By not losing signal in the first conversion, the gain required at 4 GHz is reduced. Noise figure is in

COMBINING AVANTEK VTO 8360 AND HFET 1101 GaAs-FET FOR TUNEABLE 4 GHz TO 70 MHz DOWN CONVERTER USING ACTIVE MIXER



USING AVANTEK 8360 VCO AS LO SOURCE FOR TD-2 MIXER



theory easier to establish with less expensive devices and fewer of them.

The 'interim GaAs-FET Active Mixer' now in operation at the Coleman terminal is shown here. It employs a single HFET-1101 and the same previously described AvanteK 8360 VCO to drive the mixer.

The simplicity of the system is evident in the schematic and circuit layout. Here you are going from GHz down to 70

NOTES:

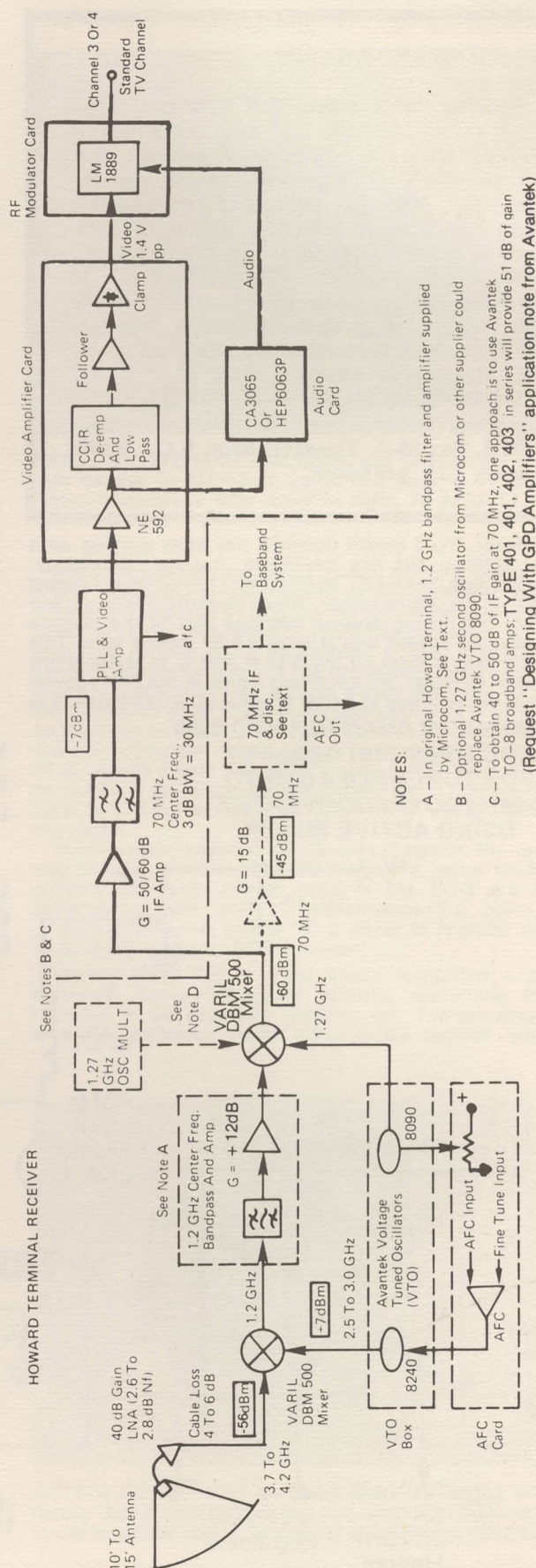
- RFC! - 4 turns # 28 wire, 1/8" diameter
- L1 - 6 turns # 12 wire, 3/8" diameter slug tuned tapped 2 turns from bottom (similar coils in RADIO SHACK coil and choke package)
- L2 - 2 turn output link
- C1 - select to make L1 resonate at 70 MHz
- Circuit board **must be** Duroid (.031)

Sources: Avantek VTO 8360 (avantek, 3175 Bowers Ave., Santa Clara, CA 95051); Hewlett Packard HFET-1101 (available through Hallmark Electronics Corp., 1208 Front St., Bldg. K, Raleigh, M.C. 27609 / attention Paul Koeppen); prepared down conversion circuit board (Duroid) from Robert M. Coleman. RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

If you happened to be one of the first 500 or so to receive your Howard Terminal Manual, you did **not receive** the errata sheet which includes some error-corrections. Most of this information was provided during the Howard Terminal session at SPTS '79 although if you were in attendance it might be a good idea to **re-check** the following against your SPTS '79 acquired corrections.

-
- A schematic diagram of a circuit component, possibly a transistor or diode. It features a central rectangular block with several lines extending from it. On the left, a vertical line connects to a horizontal line that then branches into two diagonal lines. On the right, a horizontal line connects to a vertical line that then branches into two diagonal lines. At the bottom, a horizontal line connects to a vertical line that then branches into two diagonal lines. The diagram is drawn with simple black lines on a light background.

- Users of the Howard Terminal Manual are encouraged to continue the 'feed back' process by sending questions, corrections, changes or additions to Satellite Television Technology, P.O. Box G, Arcadia, OK 73007.

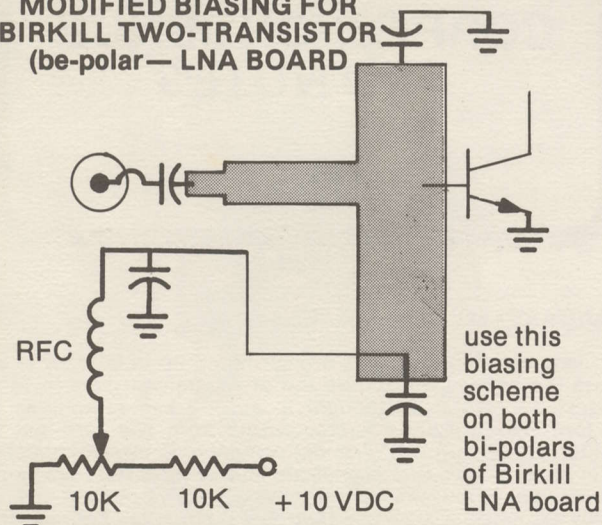


LNA DESIGN & APPLICATION NOTES

Followers of the LNA progress scene are aware that in the July 1979 issue of CATJ English experimenter Steve Birkhill presented a circuit board layout for a two-stage bi-polar LNA for 3.7 to 4.2 GHz. The same information appears in the appendix section of the **Coleman TD-2 Conversion Manual**.

Several users of the basic Birkhill scheme have reported some instability problems with the bi-polars. Experimenter Robert Coleman has developed a cure for that instability problem; by modifying the biasing arrangement as shown here. The biasing change should be duplicated for **each** of the bi-polar stages and tune-up should follow the guidelines found in the Coleman Manual. The 10K pot is adjusted for optimized performance and this results in a stable operating condition.

MODIFIED BIASING FOR BIRKILL TWO-TRANSISTOR (be-polar — LNA BOARD)



Those who have elected to duplicate Birkill's work with the HXTR series of bi-polars should be aware that if you detect an instability problem with the HXTR type amplifier, it will probably cure by changing out the 4.7 pF gate bypass capacitor with a larger value (perhaps as high as 270 pF); chip capacitors of course at this frequency range.

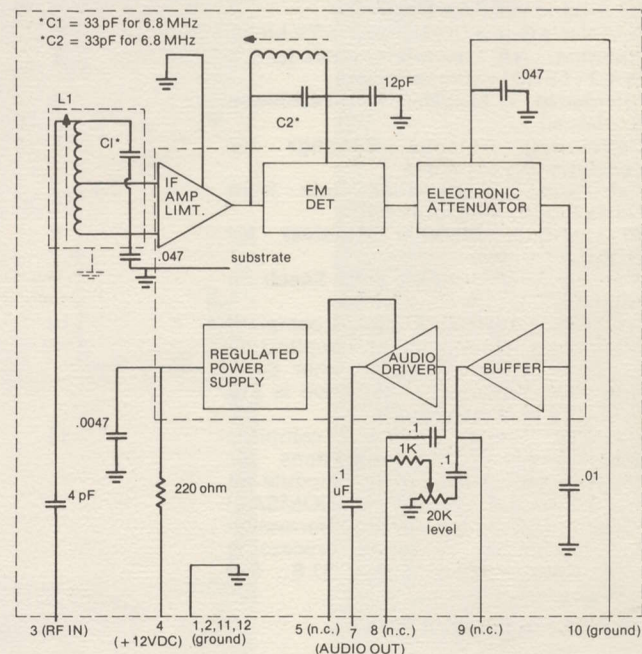
Several experimenters including Taylor Howard have been working with California's DEXCEL to work out a do-it-yourself LNA using DEXCEL GaAs-FET devices. Preliminary indications are that DEXCEL GaAs-FETs will operate in a modified circuit in this application without an isolator (circulator); good news indeed since the cost of the isolator is often higher than the cost of the GaAs-FETs! DEXCEL came away from SPTS '79 apparently convinced that a substantial market for their devices exists in the 3.7 to 4.2 GHz region and we expect to see much more activity from this California supplier in the coming months.

BASEBAND INTERFACING UPDATE

SUBCARRIER AUDIO DETECTOR

John Shelton of Bloomington, Indiana (3521 Stafford Drive, 47401) suggests that the RCA XL-100 television receiver has a **standard module** available on a replacement basis through local RCA distributors which makes a dandy audio subcarrier demodulator for any of the common audio subcarrier frequencies one is likely to find in use in bird circuits.

MODIFIED RCA PM-200 FOR TVRO RECEIVER Sub-carrier Demodulator



The Sound Detection Module (**PM200**) requires only two part changes to take it from the nominal 4.5 MHz i.f. range up to either 6.2 or 6.8 MHz. Parts shown are for the standard 6.8 MHz sound carrier found in most SATCOM activities although slightly larger capacitors at the C1 and C2 locations would allow you to hit 6.2 MHz as well. A really clever person could align a bank of PM-200 modules with suitable switching to allow instant switching over the 5.5 to 7.4 MHz subcarrier ranges employed.

Hats off to John Shelton for discovering this quick and dirty modification to an existing module for ever-easier reception!

TECHNICAL LITERATURE AVAILABLE

MICROCOMM APPLICATION NOTES

A number of "app-notes" prepared by H. Paul Shuch of Microcomm (14908 Sandy Lane, San Jose, California 95124) are available. For each app note requested send \$1.00 (U.S. currency; outside of U.S. send 3 IRC's per app note) plus a stamped (15 cents U.S., extra payment outside of U.S.) self addressed envelope.

Title	App-Note #
Solid State Microwave Amplifier Design	1
Cost Effective Modular Downconverter for S-Band WEFAX Reception	2
A Vidiot's Guide to Microwave TV Links	3
Antenna/LNA Tradeoff Analysis for 3.7 to 4.2 (TVRO) video terminals	4
Microstrip - Magical PC Technique Explained	5
Calculating Antenna Bearings for geostationary satellites	6
Calculating Preamplifier Gain from Noise Figure Measurements	7
A Low-Cost Modular Receiver for DOMSAT Video	8
A Low-Cost Microwave Spectrum Analyzer	9
RX-1691 Instruction Manual - complete schematics, installation and application information for S-band Weather Satellite downconverter. Note: Price is \$10 in U.S., \$12.50 elsewhere.	10
RX-4200 User's Manual - complete schematics, circuit descriptions for Microcomm downconversion module set for 3.7 to 4.2 GHz video (DOMSAT) reception; includes circuit information for compatible baseband processing unit. Note: Price is \$25 in U.S., \$30 elsewhere.	11

SATELLITE INNOVATIONS

Satellite Innovations (P.O. Box 5673, Winston Salem, N.C. 27103) has a variety of microwave and satellite parts, plans and supplies including chip capacitor kits, feedhorn tubing (2" diameter), Teflon PC board and various sub-assemblies for a TVRO receiver plus plans for a polar mount and rotating feed horn. Inquire directly.

ROBERT M. COLEMAN

Satellite experimenter Robert M. Coleman has a number of PC boards and chip capacitor kits available for the construction of GaAs-FET LNA stages, bi-polar LNA stages, an active mixer utilizing a GaAs-FET device and AVANTEK VCO. For full information contact Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

MICROWAVE GENERAL

Microwave General (2680 Bayshore Frontage Rd., M.S. 210, Mountain View, Ca. 94043) has a data sheet describing a 10 foot diameter 3.7 to 4.2 GHz reflector equipped with a high efficiency Cassegrain feed system which they claim makes the ten foot reflector function with gain equivalent to a full 12 foot parabolic. The antenna is molded, one-piece construction, with a flame sprayed selective surface. Full details are available directly from MG.

INTERNATIONAL CRYSTAL MFG CO.

ICM (10 North Lee, Oklahoma City, OK 73102) has a data sheet describing their newly released TV-4200 satellite receiver; a 24 channel frequency agile double conversion receiver with dual audio outputs for 6.2 and 6.8 MHz. Contact ICM for full details.

AVCOM OF VIRGINIA INC.

AVCOM has a short-form manual that describes their PSR-3 satellite receiver designed for 'low cost reception' of satellite video (and other modulation format) signals. Contact AVCOM at 10139 Apache Road, Richmond, VA 23235.

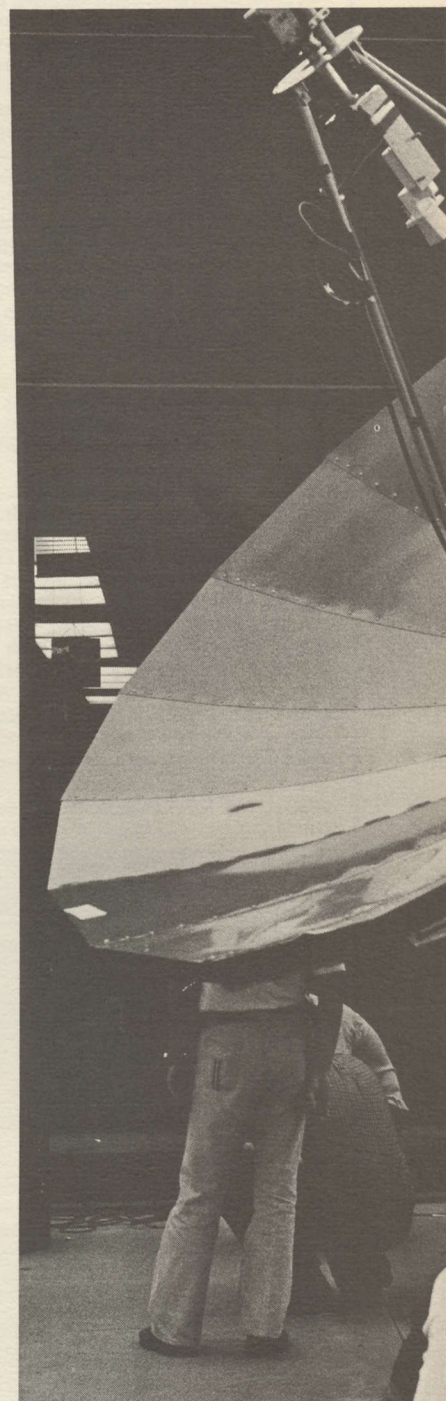
TECHNICAL CORRESPONDENCE AND NOTES

STANDARDS and VERSATILITY

Private satellite terminals are springing up in backyards all across the nation. But before the phenomenon goes too far I suggest we give some thought to making key assemblies in the terminals quickly interchangeable from one terminal to another. By having key terminal components interchangeable it will be far easier to demonstrate and confirm improvements in performance without complex and expensive test set ups, or hastily established hook ups that may themselves degrade the performance beyond the point of meaningful comparisons.

One important area for some 'standardization' is the LNA mounting fixture. It is desirable to have an attachment system that will accept a friend's LNA and vice versa. Being able to quickly swap LNAs will permit fast diagnostic and performance comparisons. Most private terminals have an LNA attached to the feedhorn and they pipe the signal through a length of coax indoors. This configuration has maximum flexibility at a moderate increase in system cost; typically the LNA must have an additional 20 dB or so of gain to make up for coaxial cable losses and this adds the cost of two or so stages of additional bulk gain at 4 GHz to the system. An alternative is to integrate the LNA and the down conversion front end, but to do this may reduce system flexibility (i.e. separating the LNA portion may become significantly more difficult for comparison purposes). If your system does go in this direction, some thought should be given to splitting up the LNA portion from the balance for test and comparison purposes.

PARAFRAME



MOST-ADMIRER AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150° K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449

Phone 312/534-7435

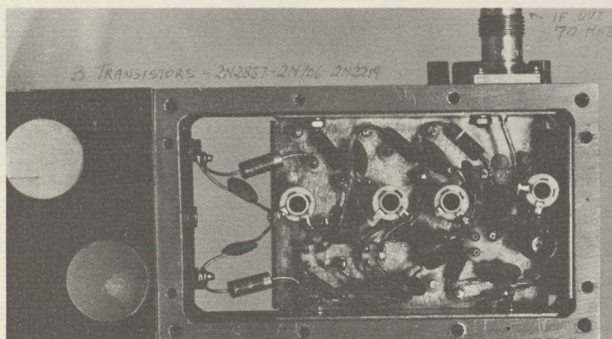
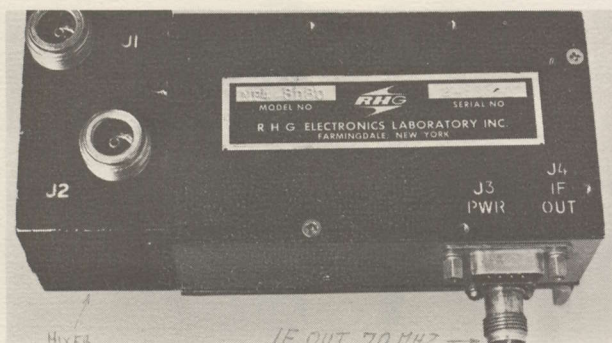
At the SPTS '79 gathering in Oklahoma it would have been instructive to be able to swap various different brands and models of LNAs onto a dish to see first hand how different noise temperatures impacted on the picture quality. Unfortunately since the LNAs all seem to have slightly different configurations, there was no easy way to conduct such tests. At the very least I suggest that we standardize on the size of bracket that the LNA mounts to; such as to a 1 inch pipe. Such a mount would allow the pipe to telescope into a second tube which can then be rotated for polarization switching and the telescoping portion would allow fine tuning of the focus point between different feed horn configurations.

There are many features which will add to the utility and fun of your earth station. As we get further into the exciting field of satellite reception, the importance of exchanging components will increase. Standard mounting techniques and flexible system capabilities will go a long ways in advancing our knowledge and the performance of our individual earth stations.

R. Andrew Hatfield
AVCOM of Virginia, Inc.
Richmond, VA 23235

Andy makes an important point. With several thousand individuals all working on their own 'custom designs' for their own earth terminals we are bound to have several thousand slightly different approaches. This suggests that as an industry group we would do well to start working now, perhaps through a steering committee, to prepare some suggested guidelines for standardization in those areas where standards of design make the most sense. If such a committee got started now, it could have adequate time prior to SPTS '80 number one in Florida (in February or so) to make a set of recommendations and a full report for floor discussion. Who wants to serve on such a committee and what about getting Andy Hatfield to chair it? What do you think??

LOOKING FOR HELP



Your assistance is sought with regard to the attached photographs of a down converter. Is there anyone who might have some knowledge of this device? I am wondering if only the mixer could be used to obtain an i.f. of 450 to 950 MHz

for reception of INTELSAT on 3.7 to 4.2 GHz, perhaps using a fixed local oscillator on 3250 MHz. All I know about the unit (an RHG Electronics Lab's MP4 8D80) is that it has a (apparently standard to TVRO) i.f. output of 70 MHz. I have tried to communicate with RHG Electronics but apparently they are no longer in existence.

L. Bruzzichesi
P.O. Box 1
Thyolo, Malawi
(Africa)

Satellite enthusiast Bruzzichesi lives in a portion of Africa where even the most rudimentary of parts are very-very difficult to obtain. Any reader who has schematics, or other helpful information for him would be doing a good turn for international goodwill by writing to him directly. He has been attempting to put together a private TVRO (to receive intelsat) for more than a year now but progress is very slow. Oh yes, put 86 cents postage on your letter if it weighs less than two ounces!

MESSY HOWARD BLOCK DIAGRAMS

Yesterday I received the Howard Terminal and the Coleman Terminal manuals from STT. Everything is OK except that page six of the Howard Manual has a block diagram with numbers and letters that are very difficult to read. Will you please send another copy of page six for this manual?

Paul C. Vickberg
Afton, MN 55001

Our printer really did a lousy job on printing some of the Howard Manual page 6's. He's made it good however by printing a new block diagram on a special stickum-backed (peel it off and stick it down) paper stock. If you have this problem with your manual, drop us a note at STT (P.O. Box G, Arcadia, OK 73007) and we'll get you off a paste-it-down replacement diagram.

WHAT'S THE BIG DEAL?

I happened to catch the Satellite Magazine program on transponder 21 and I was rather surprised by your enthusiasm over the "low cost" Howard and Coleman terminals. I have been operating a backyard terminal for quite some time now; I go from 4 GHz to the video input of the monitor for less than \$100.

I have been very hesitant about publishing any of my work because of the great amount of mail it would generate. My system uses a stressed dish (15') of my own design. The HNA (high) noise amplifier is presently a couple of NEC-6435 devices that sell for \$17. I am not receiving snowfree pictures but I can tell what is going on.

The weak link in my system is the LNA. The present receiver uses a HP2835 mixer driving a couple of MRF901's into a voltage tuned UHF tuner. This drives a 60 MHz i.f. strip consisting of three MC1350 IC's. The last stage is into full limiting on just noise. The demodulator is the NE-5618 and sound is handled by a CA3089. The LO is a free running MRF-901.

I am curious why Robert Coleman chose the HP GaAs-FET devices since NEC has better devices at a cheaper price. The NEC devices are available off the shelf while the HP devices run 8 weeks.

John Yurek
RD #6, Box 413
Irwin, PA 15642

John apparently does not want letters (he said he was afraid to 'publish' for fear of the mail) but he writes a pretty good letter himself. Coleman chose the HP devices because he gets off the shelf delivery and they (meaning HP) have been very helpful to him in his experiments. Our sources indicate the NEC and HP devices are comparatively priced.

MOUNTS AVAILABLE

As of this writing we still have some of the polar mounts available that came off of the 10 foot dishes which Stanford had previously used here in the Bay Area for radio astronomy. These mounts weigh about 1500 pounds each, and will give the user complete motor driven control of azimuth and elevation for probably as big a dish as he can find to put on them. They are priced at \$450 each, FOB Palo Alto.

Lance Ginner
60 Cody Lane
Los Altos, CA 94022
(408-941-1135)

Anyone looking for a motor driven mount at a reasonable price is urged to contact Lance directly before they are all gone.

VERTICAL BAR INTERFERENCE

Not long ago we ordered a 'Satellite Study Package' from STT and after receiving it and digesting the material we have become interested in the idea of assembling a satellite terminal for use here at Arizona Prison Complex. The idea is off the ground and considering that the spark for the project came from your 'Study Package' we thought you might be interested in the progress we are making. From all of my research, I believe this may be the first such (prison) installation in the country. We do appreciate all of the information you have provided and we are hopeful . . .

Jeff Martin
Admin. Asst. III
P.O. Box 629
Florence, AZ 85232

OK fellas . . . when the copyright and FCC people hang you up because you are watching TV without the necessary agreements and license you can now request that you spend your time at the Arizona Prison Complex in Florence; at least you will not have to go cold turkey on satellite programming while you pay your debt to society!

LOW COST VIDEO MICROWAVE

In attending SPTS '79 we failed to make contact with Bob Richardson, the fellow who is supposed to be the chief designer of low cost multiple channel short haul microwave using the Gunnplexer sets from Microwave Associates. Can you help?

No Name
(which makes it difficult
for us to directly answer!)

Richardson lives at Chautauqua, New York and has an unlisted post office box. His telephone number is 716-753-2654 however. His latest work involves shoving up to five channels of NTSC color video, with accompanying 4.5 MHz offset audio, through a single Gunnplexer transmitter and then recovering the multiple channels of television with a single Gunnplexer receiver that translates directly down to the low band VHF TV channels. In a similar area, a new outfit in Pacheco, California (TCI Corp., 411 N. Buchanan, zip 94553 and telco 415-676-6102) is now advertising their model TVX10 microwave transceiver which claims to allow transmission and reception of 10 GHz video plus audio for \$350 per 'station'. For readers outside of the U.S. and Canada, or where local rules don't prohibit such nonsense, this might make a very good short haul, low cost video plus audio microwave system to tie TVRO reception to neighboring areas.

DOWN DEEP

I understand most satellite antennas are directed towards the 'mainland' of the U.S.; could you advise me of the expected signal strength here on St. Croix in the U.S. Virgin

Islands? Our local PBS station on St. Thomas uses a 30 foot (Collins) dish and the usual mix of expensive equipment. Can I expect to make the grade with a 12 or 16 foot antenna?

Glentronics, Inc.
St. Croix, USVA 00820

The EIRP levels in your part of the Caribbean are in the 27 to 28 dBw region or around 8 to 9 dB below those we play with here in Oklahoma. With a 12 foot dish and a 100 degree LNA you'd have about 5 to 6 dB C to N; a 16 footer would get you up around 7 to 8 dB C to N which is at best impulse noise laden. But it would sure beat watching WSVI or trying to tune in channel 4 from San Juan on the TV and the English sound track on FM!

CIRCUS FOR ADULTS

I wanted to drop you a note and say how much I enjoyed SPTS '79. I'm sure quite a few may have thought about thanking you but are perhaps too caught up in construction efforts right now. I bought Taylor Howard's plans and have constructed my own terminal. Your gathering was just the ticket to get rid of a funny felling . . . I'm not the only one who is crazy enough to try it. The informal atmosphere was what I enjoyed most. I came to Oklahoma expecting the usual Hollywood sales hype. Living in southern California does make one gun shy. Instead I was confronted with a new problem . . . how would I see and hear everything with so much going on at the same time? Your circus for big kids was great fun and I loved it!

Stephen Gibson
Los Angeles, California 90004

SPTS '79 did have a 'three ring appearance' at times; between the main lecture hall, Paul Shuch's overflow crowd in the ante room and the always bustling exhibit hall area. We'll try to keep the apparently universally appreciated 'informal atmosphere' at SPTS '80 events in the Miami area in February and out at Stanford in June.

MANUAL FEEDBACK

On page 20 of the Coleman manual it mentions an i.f. amplifier available as a CATV antenna mounting pre-amp from Blonder Tongue Labs with a noise figure spec of between 1 and 2 dB. I have a new B-T catalog and the closest thing I can find is a 5.5 to 7 dB low band (VHF TV) unit; their model CMA-LB. Alternately, I did find a Winegard model AC-9260 with 26 dB of gain and a claimed noise figure of 2.2 dB over a 54 to 88 MHz passband. Then in the Howard Manual, page 13, it states that SCI had a price slash and their new prices were \$995 for a 150 degree K LNA, and \$1095 for their 120 degrees K LNA. At SPTS '79 Tom Humpheries quoted me \$1395 for their 120 degree unit and \$2800 for a 100 degree unit. I'd also like to note that you provided us with an excellently operated and extremely informative seminar at SPTS '79 and I want to encourage you to continue the fine work you have been doing.

Robert (Bob) Hughes
Cypress, CA 90630

Thank you for the bouquets. Blonder Tongue really ought to be able to do better than 5.5 to 7 dB noise figure in a 54 to 88 MHz antenna mounting pre-amp. Gracious; those are 1950-ish type specs with 6BO7A type tubes! B-T does have a single channel (CATV grade) pre-amp which is their SCMA which we have measured against their own lab measurements data sheets in the 1.5 to 2.5 dB region. But this is single channel and you really need at least 20 to 30 MHz of i.f. passband centered in your 70 MHz region i.f. output from your mixer to not lose important FM video (and sub carrier audio) information. Another possibility is Hansel Mead at the Q-BIT Corporation (P.O. Box 2208, Melbourne, FL 32901). Q-BIT

really makes a better grade VHF pre-amplifier than B-T these days and if Hansel doesn't have a 2 dB or better noise figure across 54 to 88 MHz available, we suspect he would make you up one in fairly short order. Winegard products through the years have been good workhorses and reliable but they sometimes get a bit spec happy in their data sheets. Still, a claimed noise figure of 2.2 dB is hardly that out of line with the real world so perhaps the AC-9260 is the answer. Winegard prices are usually fair, and the line is well stocked at wholesale houses that cater to TV shop people. As for Tom Humpheires and his apparent rubber pricing sheet; we kind of understand Tom's dilemma. In the CATV marketplace competition has forced LNA prices down (down, down). Tom reacted by staging a 'summer sale' for LNAs and the SCI receivers, making a mailing to the full cable industry. He also mailed brochures to several thousand 'private terminal enthusiasts'. In these mailings SCI extended their 'installing distributor price' to anyone who sent cash with order by a July 31st cut off date. Their installing distributors, meanwhile, took note of this and raised bloody hell with Tom. The Howard manual noted the 'summer sale' price discount, but by the time we got to SPTS '79 in mid-August the sale was over. Not anxious to lose the 'installing distributor' business, Tom held the line on the July 31st cut off date and thus the price rise from the Howard Manual quoted pricing. Our feeling is that wherever the current LNA pricing rests, it is but a temporary plateau. Over the next year LNAs will continue to drop.

FAR OUT

I am wondering how to use microwave technology to capture gamma rays or neutrinos. Please do not laugh. For the past few years I have been studying astronomy; my reason is this. I am hooked on solar energy and I am trying to combine astronomy and radio.

The solar collector on the roof or southern exposure of a building is sized in proportion to the square footage of the floor space to be heated. The larger the building to be heated, the more solar collector required. What occurs to me is that there ought to be some way to 'tune' (as in RF circuit tuning) the heat rays or the light rays to a solar collector. Recall if you will that radios at one time were monstrous affairs sitting on the floor; now they fit into the palm of your hand. Is not the same size reduction possible with solar collectors?

If rays can be tuned, why not at night or even on cloudy days? Right now I am using aluminum gutter aprons (two L sections form a rectangle and then a stack of rectangles form a series of parallel U sections) to attempt to tune the heat rays. Yes, I know that heat rays are like a billionth of an inch. That is the challenge. Is there anyone out there who can help me with this project?

N. D. Perlman
4420 N. Sacramento Ave.
Chicago, IL 60625

There we have the Science Fair project of the month fellows.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

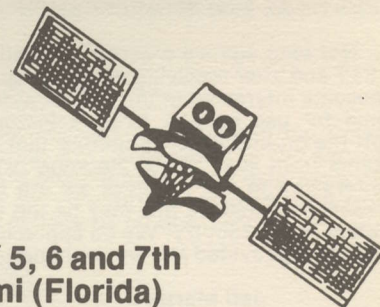
SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

SPTS 80 MIAMI



**FEBRUARY 5, 6 and 7th
at the Miami (Florida)
Bayfront Park Auditorium!**

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

SPTS '80 / MIAMI

Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

TECHNICAL NEWS NOTES

SATCOM FII SAGA CONTINUES

The checkered history of RCA's SATCOM FII bird added yet another chapter on September 13th (a Thursday) when RCA reportedly 'lost control' of the bird around 6 AM eastern time. Apparently RCA's ground control people detected a stabilizer control deviation and in attempting to correct for the error the bird decided to 'flip'. Thus abruptly cut off all downlink communications including the multiple-transponder feeds directed at Alaska (RCA ALASKOM is primary supplier of inter-state communications in and out of Alaska for the state and FII is the bird for this purpose). RCA promptly began pulling important Alaskan traffic off of FII and re-routed it through SATCOM FI; the usual cable TV bird'. Transponders 3, 7, 9, and 21 were impacted by the 'yank and replace' activity with 21 down and gone from regular CATV service most of that day. By late on the 13th RCA had regained control of FII and cable service channels were normal on the 14th.

SATCOM FII has been a 'difficult bird' since launch. It lost one transponder during or immediately after launch, and during the launch phase a cable that helps hold and guide the solar panel array broke or snagged. For the full life of the bird since the launch the ground control operators have had to 'hand crank' the solar panel backwards around a dead spot or high friction zone every day as part of normal operations. At various times other transponders have acted up on the bird and RCA's concern about the long term health of FII may have played a part in moving all of the cable traffic (which was on FII until June 1st of 1978) over to FI.

Had RCA totally lost FII, they have a backup agreement with the Canadian TELESAT group that operates ANIK whereby up to 11 channels of SATCOM traffic could be moved to one of the ANIK birds for emergency service restoration. However the health of the ANIK birds involved (I and III) is not good and until RCA has FIII in orbit and operational early in 1980 there are many very nervous people depending on the continuation of the existing services.

NETWORK use of satellites continues in study phase. NBC first asked WU, COMSTAR and RCA for proposals last spring; since joined by ABC. First responses are due back this month. Nobody's doing much talking but apparently most serious plan calls for east coast feed of programs to central time zone and west coast feed to mountain time zone to allow stations in both zones to re-adjust their programming hours to eastern/pacific release times. Both central and mountain now release an hour earlier than the coasts, local time. This one is likely to drag out several years.

SMART package offered by RCA to broadcasters at NAB meeting in Dallas this spring seems to be running backwards. RCA said total of 'more than 200 stations' indicated they

SATELLITE 'Ham' NET

Meets Sunday at 1800 zulu on 14.303 or 14.311 (latter frequency used when 14.302 is busy with Caribbean hurricane net traffic). Net control is either W5KHT or W5JG. Typical check-ins include K4AWB (Robert Coleman) for those working on Coleman TD-2 conversion system. Will move to 1900 Z when daylight time ceases.

would accept 'free earth terminals' from RCA/SATCOM but many reportedly have had second thoughts since RCA would dictate where terminal antennas would point and when/where they could be used. In interim several group broadcasters have committed for their own terminals which almost without exception are 'steerable antenna' versions since broadcasters see ability to change satellites very important to their use of birds. One version available guarantees to go from bird to bird in ten seconds time!

JOHN BLAIR and Company, a commercial oriented firm doing business nationwide, has finished test of sending commercials via satellite. This has implications for stations considering RCA SMART package since RCA had hoped that two types of customers would line up to pump video/audio to TV stations equipped with SMART gear; one of those being advertisers and agencies. Blair feels that satellite is economical way to send out first generation dubs of commercials to broadcasters, is looking at establishing receive terminals in largest 50 market centers in U.S. before end of 1980. Blair will deal with stations that already have terminals to represent them in some markets, encourage stations to install terminals in others, may even put in terminals themselves in remainder. Back to back commercials may therefore be expected in some time slots on some transponders by spring of 1980.

U. S. CHAMBER of Commerce is latest to announce it is investigating using satellites to distribute TV programming. Chamber has new TV production center in Washington, considers TV high class way to get message across, would offer programs directly to stations via satellite.

COMSAT announcement in mid-summer that it would like to provide up to six channels of 'subscription television service' via satellite, for North American viewers, still has industry buzzing. COMSAT proposal is just that ... a 1982-83 time frame plan for between \$15 and \$25 a month they would distribute programming via 12 GHz satellite to anyone who wanted to 'subscribe'. System would be 'secured' with uplink commands sent via satellite to individual subscriber terminals; those terminals not receiving proper coded message would simply not produce video/audio outputs. Every terminal would have its own decoder and every decoder would have custom one-of-a-kind decoding sequence. Anyone who did not pay for a specific program, channel, or was late with payment would be 'missed' in data burst sent out every ten minutes via satellite to turn receive systems on and off. Like some pay cable security systems, the terminal would function fulltime but nothing 'intelligent' would appear at output unless coded signal for that terminal was received to 'switch on' the terminal output. COMSAT is running into considerable pressure from U. S. broadcasters with proposal but has now briefed White House telecommunications personnel on system and is holding preliminary talks with massive entertainment programming distributors such as MCA. **RCA** mystery over who will be up on FIII, and where, continues. When RCA launches FIII in November/December, and then goes through 90 day bird-orientation and check our period, all existing FI cable services

are supposed to switch over to FIII (to be at 132 degrees west). Only RCA indicates that perhaps some of the existing services now on FI **will not move**; they'll be left behind on FI. RCA says they have all 24 of the FIII transponders sold and they have been quoted as saying an additional "13 cable programmers are in line" for the transponders on FI after the move. Cable programmers feel that they have to be an FIII with HBO and WTBS and the other biggies or they may lose shot at being carried by many cable systems that will not install a second dish for second bird. SIN (Spanish International Network) has filed against RCA claiming they will be one of those left behind; rumors (and we label them as such) suggest WOR may be another one left on FI. RCA has always been very careful about keeping a tight rein on information of this sort, and they have also been good at seeing that when a move of this sort occurs that they 'arrange' transponder users so that there is something worthwhile on each bird/polarization. Same thing happened when initial cable users were on horizontal and RCA moved to vertical for expansion channels a year ago. Nobody wanted to be on vertical fearing that cable firms would not spend extra money to have vertical capability. That proved a needless worry but cost of setting up for two birds is far greater than cost of setting up for two polarizations (the Swan Spherical antenna excluded!).

SIN'S GALA-VISION, meanwhile, may or maynot start off on October 26th announced date. GALA-VISION is 72 hour per week Spanish language pay cable program feed for premium service sale; movies, novellas (continuing soap-operas), sports and other features of interest to Spanish speaking peoples. Service had planned to sublet transponder 18 from Reuters for late October start.

FATE of transponder 1 on FI remains another question. Way back when, Southern Satellite Systems announced they would bring Oakland/San Francisco KTVU up on FI. However before KTVU began service SSS sold 80% of that operation to Holiday Inns of America and they finally brought it up as SCS. Holiday Inns subsequently decided it only wanted to be a customer of satellite services, not an operator, and thus in August they sold SCS to Warner Communications. Warner operates Nickelodeon on FI transponder 11 and STAR CHANNEL on 5 and 11. Officially, Warner is saying they are going to leave KTVU up on FI. Unofficially, cable industry is abuzz with rumors to the contrary. One oft repeated suggests that Warner will take off KTVU sometime after first of 1980, and sub-let transponder 1 to Washington-Post operation for a full time news format service similar to that now being readied by Ted Turner. Cable acceptance of KTVU has been dis-appointment to everyone; service in **probably** losing money so if that continues chances are KTVU's days are numbered. Only real question is what will replace it. And when.

SHUTTLE SCHEDULE keeps getting set back and with set backs come more and more delays for international space programs depending on shuttle to get birds into orbit. Latest schedule (which officials agree may still be optimistic) is as follows:

JUNE 1980 - test instruments

NOVEMBER 1980 - OSIA-1 Earth Station (pallet)

June 1980 - test instruments

November 1980 - OSIA-1 Earth Station (pallet)

February 1981 - PDRS Test

May 1981 - SSUA-A verification

September 1981 - TDRS-A (Western Union and NASA)

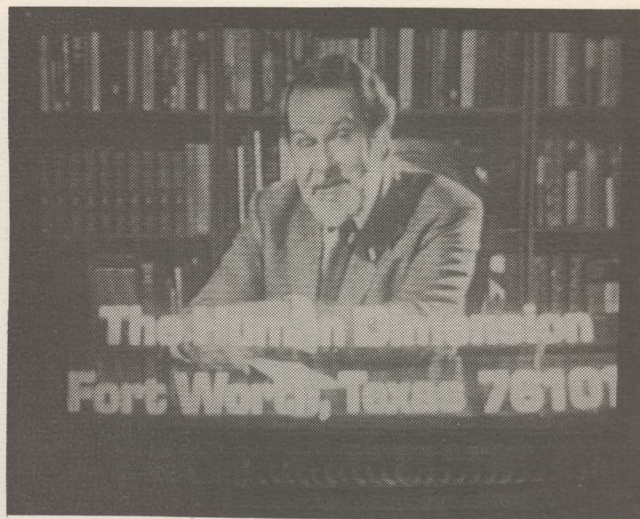
October 1981 - ANIK C1, INTELSAT V-5, SBS-1

Thus we are precisely two years away this month from current 'optimistic' projected first-use of Shuttle for launching communication satellites (everything prior is of a test nature).

ARIANE launch system meanwhile seems to be cutting their projected operational date shorter. Ariane is African based semi-private funded rocket launch system developed largely by German engineering and money and it is competitively in market looking for launch customers. Latest Ariane launch schedule is as follows:

November 1979 (LO1) - Test module and ballast

March 1980 - AMSAT Germany (amateur package) plus



test ballast

June 1980 - APPLE (Indian), Meteosat, and test modules

October 1980 - MARECS-C, and test modules

SPACE communication systems planning seems to be popular way to spend paperwork money these days. President Carter is asking Congress to re-address existing laws so that progress in space communications 'not be impeded by out of date laws'. Specifically, he wants 1) fully competitive marketplace by deregulating where regulations inhibit competition, and 2) review and tossing out of old laws that were borne under older technologies. Group called Consumer Federal of America meanwhile has asked President Carter to create a non-commercial satellite system for U.S.. They want FCC to establish much-reduced satellite use tariffs for non-profit users and are also asking for a 'national commission' to create a study of the potentials of low cost direct to home broadcasting. They could save a bundle by simply attending the Miami area SPTS in February!

BROADCASTERS are continuing to jump on satellite bandwagon although 'typical' broadcast station installation is in the \$100,000 region. Installations typically use ten meter steerable (remote, motor controlled) dishes, redundant LNAs, multiple receivers. Multiple broadcast station owner Storer Broadcasting latest to commit; seven big terminals in all.

JAPANESE NEC says it will produce 12 GHz receive only terminals in quantity but it will not enter 4 GHz market. NEC quotes pricing such as \$500 per terminal for 0.4 meter dish and electronics (LNA, receiver) in 10,000 per annum run or \$350 for 100,000 per year manufacture. They claim tests of 0.4 meter system in Japan shows 46 dB (video) signal to noise ratio with operational (and experimental) BSE satellite there.

UPI's slow-scan video plus accompanying audio, currently carried on two sub-carriers on SATCOM FI transponder 6, will combine both sets of data on a single subcarrier around November 15th (may slip because of hardware delivery problems). Presently using 6.2 and 7.4 MHz subs, apparently only 6.2 will be used after switch. UPI's system currently has around 140 CATV system users reaching some 700,000 U.S. homes. Charges are 5 cents per home per month ... but, \$100 per month minimum.

SPTS '80 set for February 5, 6, and 7 at Bayfront Park Auditorium, Miami, Florida. Three day event (Tuesday, Wednesday, Thursday) will be in popular downtown Miami water front area and will include extensive technical seminar program patterned after highly successful SPTS 79 held in Oklahoma city last August. Oklahoma City event was a sell out with 506 attendees enrolled; Miami facility can handle up to 1,500 people with separate room for H. Paul Shuch lectures (seating 350 people), main lecture hall, and space for exhibits. Even with increased capacity, STT expects SPTS '80/Miami to be a complete sell out and anticipates large contingent of delegates from Caribbean, Central and South America.

COOP'S COMMENT ON PROGRAMMING

FCC DEREGULATION AND PERMISSION

Elsewhere in this premiere issue of CSD there appears a detailed report on the status of satellite programmers; who you can and cannot 'deal with' to acquire the legal right to view certain satellite delivered programming. The bottom line is that no fewer than five channels are today either totally free of charges, or they have a one time charge of no consequence. Throughout this issue there are words about the expected deregulation of television receive only (TVRO) terminal deregulation at the FCC. A few words more, here, will I hope cement that issue.

The FCC wants to be out of the TVRO licensing business. Some FCC attorneys believe the Commission was on dangerously thin ice when in the first case it told the cable industry some four years ago that they had to get FCC approved licenses for their terminals before they could build same. Those of us who remember 1975 FCC licensing standards would be the first to point out that today's FCC licensing process, as burdensome and valueless as it may be, is a piece of cake when compared to the 1975 requirements. The FCC is not alone in wanting to be out of this needless requirement; the Department of Justice and other usually persuasive federal power groups are of a like mind. Several influential Congressman, including Representative Lionel VanDeerlin of California (who heads the House Sub-Committee on Communications) are in favor of deregulation.

Many special interest groups want the licensing to stay. The broadcasters are one; without licensing, broadcasters see a proliferation of private TVROs. Some of the cable programmers are another; without licensing, they hope to salvage at least a federal 'registration requirement' in hopes that if most private terminal people register the terminals as the rules would require, at least they'd have a starting place to begin their search for illegal viewing. Some firms who have made a considerable bunch of money processing FCC license applications (at \$1000 and up a pop) also want things left alone.

If indeed the Department of Justice is correct, and the FCC is 'out of bounds' with their licensing requirement, then

nearly 2,000 cable systems have blown more than \$2,000,000 in going through a licensing process that was in itself illegal. But far worse than that, many major projects that would have gotten off the ground a year or two ago have also been axed because of the illegal licensing requirement. The Mutual Radio Broadcasting Network, for example, announced more than 20 months ago that it was ready to install over 500 ARO (audio receive only) terminals using ten foot dishes for a national radio network link system. The FCC beat them back by waiving the 'rules' at them. The rules state that no terminals of less than 4.5 meters in size will be licensed; without rule waivers. Several other major audio networks have been iced while this is sorted out. Even worse yet, the National Public Radio Network (NPR) went ahead with an estimated 150 4.5 meter audio only terminals for their WESTAR feeds at costs that are 50% or more higher per terminal than they should have been had they been 3 meter AROs. Buying an extra 1.5 meters of antenna drove the price up 40%; going through the needless licensing process added another 10% to the costs. NPR went ahead and paid the price ... because NPR gets its money from federal and state or local fund grants. In short, tax money largely paid for the terminals and the attitude was "full steam ahead, hang the price".

The latest word as we go to press is that the FCC will 'consider' deregulation of both TVRO terminal licensing and at the same time dis-mantling the technical restrictions that presently mandate 4.5 meter or larger (commercial as opposed to private) installations in their October 10th session. Not to worry, it may well be put off another week or two not because of the weight of lobbying pressure against the deregulation, but simply because of the press of 'other business' at the FCC. My sources say that the FCC will assuredly do away with mandatory licensing; they may even do away with a followup 'registration process'. If that comes to be, installing TVRO (or ARO) will be as complex as unpacking a TV set and hooking it up; **no paperwork at all.**

When (no if) this happens, we move to square two in this complicated maturing of a new industry and television delivery service. Being free of FCC licensing is important. It will add a tremendous amount to the foundation we are all trying to build upon. Watching TV is un-nerving enough without having to post guards out front to warn of the approach of 'revenue agents'. Having a clear cut, legal right to **own** satellite TV receiving equipment **without** a license will bring dozens of new hardware manufacturers into the field. Rapidly. It provides the foundation of legitimate operation which missing to date has scared many reputable but capable firms away.

The next phase of maturing is to get the satellite programmers to recognize that this market is different than the cable market. That by working with the market, not hiding from it, there is money to be made here at the programming level. It is a complex problem that will require possibly years to resolve, but it can be done. There is no better time to start the project than now, coinciding with the deregulation of the licensing portion of the equation. Viewers and would be viewers need to urge the programmers to cooperate; programmers need to be looking for ways to resolve the conflicts forced upon them by narrow minded copyright interests. Working together, the sky is the limit.

CSD

PROGRAMMING



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SPTS '79 REPORT

SPTS '79 is history. It was quite a gathering and the 506 official registrants who jammed themselves into a facility designed to hold 60% of their number went home largely satisfied with the program, the information they were exposed to, and fired up with the excitement that can only come from being a part of a major new pioneering effort.

SPTS '79 provided many answers and left many questions unanswered. As Stanford's Taylor Howard so properly phrased on the podium, "...engineers do things because they are engineers and because their engineering virility is challenged. Sometimes however engineers do things that the social and political factions are not ready to accept". At SPTS '79 it was plainly evident that engineers had indeed been doing their thing, and would indeed continue doing their thing. The challenges presented by the turn-on of the satellite television (and indeed, satellite communications) revolution are obviously not beyond the ability of the various engineers and engineering firms working on the problems. What may be beyond the scope of simple accomplishment is how the established agencies, service firms and entrepreneurs affected (perhaps adversely) by the explosive satellite technology are going to react, deal, and eventually accept the wonders being wrought by the engineering types.

International Crystal Manufacturing Company (10 North Lee, Oklahoma City, OK 73102), hereinafter ICM, was the first to introduce an 'under \$2,000' 24 channel frequency agile receiver. The ICM satellite receiver covers the full band from 3.7 to 4.2 GHz, has

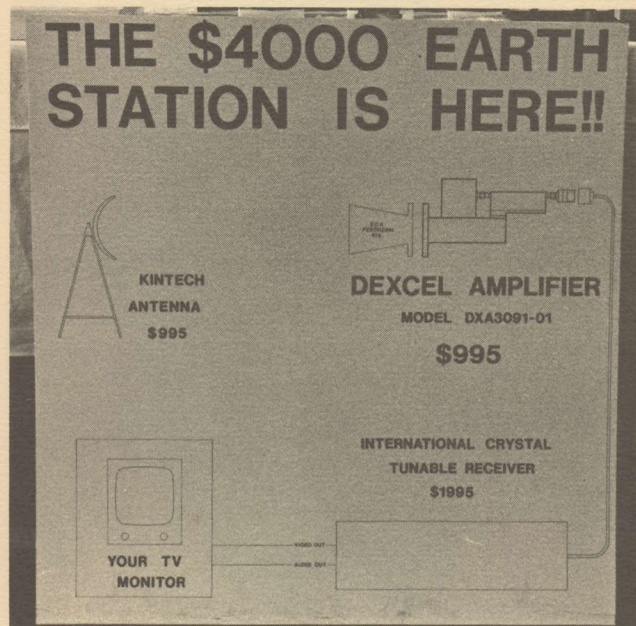


PORTIONS OF FOUR - of the five antennas installed and operational. Far right is the DALSAT 3 meter (ten foot) brought along for Gardiner/Starscan and SCI booths. A portion of the PARAFRAME behind the DALSAT 3 meter. KINTECH 12 foot kit in center and the screen mesh reflector surfaced USTC on trailer to left. Second USTC (fiberglass) is out of camera range to left.

dual (6.2 and 6.8 MHz) audio baseband outputs, a built-in LNA power supply and a 12 position step tuning switch that is augmented with a fine tuning control. ICM's Royden Freeland has been working on this project for more than a year, ever since he came out to Coop's Lab and saw the operation on the Lab's twenty foot monster antenna. Inside the ICM receiver one finds a generous helping of H. Paul Shuch (Micro-comm) modules that gets the 4 GHz received signal down to the final 70 MHz i.f. (through a dual conversion scheme). The ICM receiver initial supply that appeared at SPTS '79 was sold out on the floor before the Seminar was finished.

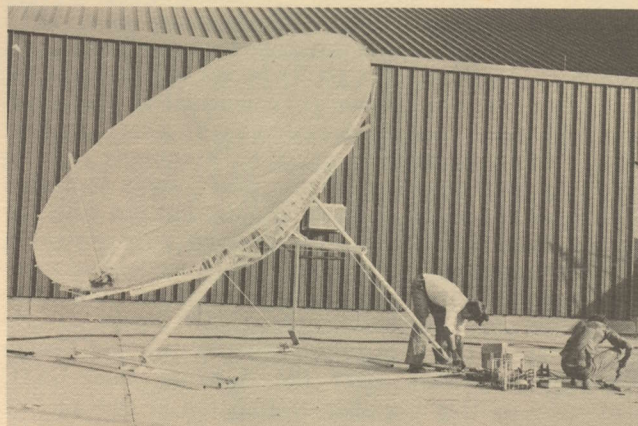
The appearance of the ICM receiver sparked the co-appearance of a pair of billboard signs which proclaimed "the \$4,000 earth station is here". Interpretation? If you take the ICM receiver, a DEXCEL 30 dB gain 150 degree K LNA plus a KINTECH Technology 12 foot assemble-it-yourself antenna kit, you have a complete station (less the cables and minor bits and pieces) for \$3,900. Alas, a couple of flies flew into the mixture **after** SPTS. John Kinik, who labored very long and very hard to get his 12 foot antenna out of its packing crate and together (ably assisted by several volunteer SPTS attendees) for demonstration purposes returned to California unsure whether or not he **really wanted** to be producing 12 foot (or any size of) 'kitable antennas'. At last word John was toying with the idea of **not** producing antenna kits but rather producing and selling a detailed set of instructions telling others how to buy in their local areas common (Reynolds, etc.) aluminum extrusions and sawing and hacking and drilling their way to their own self-constructed and self-assembled 12 foot parabolic.

Another new receiver, seen for the first time at SPTS, and showing considerable promise was the PSR-3 Satellite Video Receiver from **AVCOM Satellite Systems Division** (10139 Apache Rd., Richmond, VA 23235). AVCOM's Andy Hatfield, like ICM's Freeland, got started with a private terminal experimental installation about a year ago. As an accomplished RF engineer Andy took a long and hard look at the then existing 24 channel tuneable receivers and decided that he could do it as well (or better) for far less money. The PSR-3 is a double conversion receiver with a first i.f. at 880 MHz and a second i.f. at the more or less standard 70 MHz. One of the many sleight-of-hand tricks build into the PSR-3 is the tuning mechanism; a dial that looks strangely like a voltage meter and a single knob (pot) control. A table on the receiver front panel tells you what voltage to dial up on the meter face with the single tuning knob to produce the transponder you are interested in. Another interesting wrinkle is a optional subcarrier demodulator that gives you an output that will feed directly into a standard FM tuner or receiver. In this way the new (NPR) stereocasts on WESTAR can be dialed up and enjoyed in stereo. Yet another feature is an automatic scanning system that electronically tunes the satellite receiver through the 3.7 to 4.2 GHz frequency range at an adjustable rate. As Hatfield points out, this feature should prove especially helpful in both demonstrating the satellite service and initial antenna alignment tests.

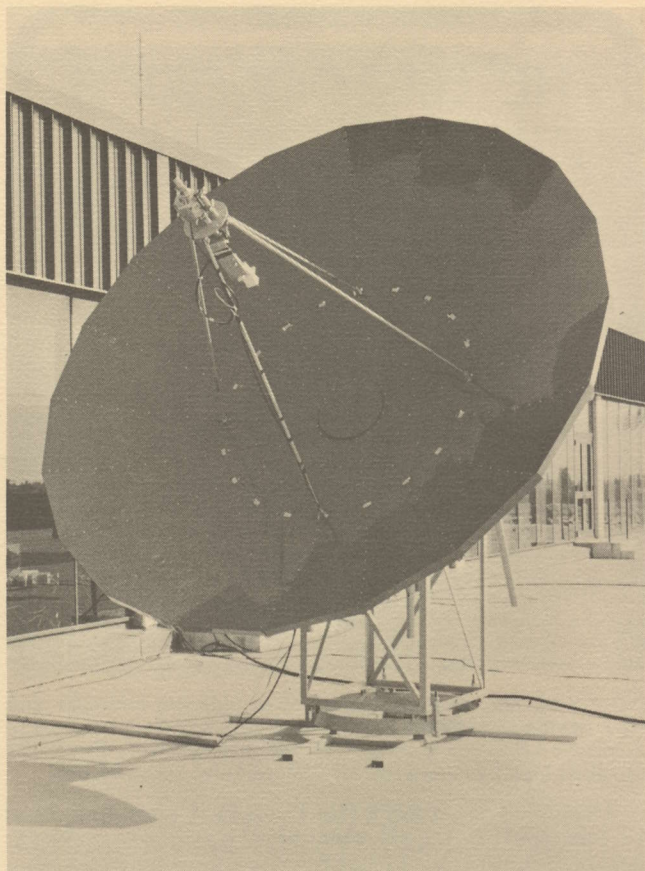


DOWN TO 4K - Promotional signs at both the DEXCEL and ICM booths proclaimed that by marrying a certain antenna to a certain LNA and a certain 24 channel receiver, the home terminal installer could be into operation for about \$4,000.

Those who have been Jim Vines fans were delighted to see Jim's (almost) baby-blue parabolic at SPTS; up and running. Vines has been working for more than a year to get to the production point with his novel 12 foot parabolic antenna and SPTS was the culmination of that year-long effort. In fact, the first time the antenna was actually outfitted with a feed and LNA and hooked to a receiver was at SPTS after having been trucked down from Illinois. That took alot of guts to show up with an antenna that had not previously been field tested! Compared to the other antennas at SPTS (there were four 12 footers, and a ten footer on hand)



KINIK AND THE SUN - battling 100 degree temperatures, thousands of screws and bolts and small pieces of hardware, KINTECH's John Kinik (second from right) continues the effort to get his 12 footer operational before SPTS closed down. He made it. And then had to take the whole thing apart again!



the **PARAFRAME** (Box 423, Monee, IL 60449) antenna was big and beefy and it looked as if it would do well in direct combat with a Russian TU47 tank. The last word we heard from Vines was that four to six week delivery is now 'standard'.

Stormy and Danny Weathers of **USTC** (P.O. Drawer S, Afton, OK 74331) had previously shown a 12 foot fiberglass molded antenna at the Las Vegas NCTA show late in May. When Stormy learned that some less expensive 12 footers were likely to show up at SPTS (his fiberglass antenna is designed for heavy wind loads and the CATV-MATV market) he set out to see what could be done with lightweight construction. The result was a 12 foot screen mesh antenna with a rotating feed (now a common practice, using a TV antenna rotor to twist the feed horn) which the USTC folks indicated would sell for \$1750 or thereabouts; but not with the screen mesh surface. Stormy decided after watching the other antennas at the show that he would feel more comfortable if the antenna was surfaced with .035 aluminum sheet. Several people at SPTS were already signed up as USTC installing distributors and Danny Weathers reported after the Seminar that USTC would be putting together around ten of the 12 foot light weight antennas on boat-type trailers so that their nationwide network of installing distributors would be able to pull up to a prospective user's location, swing the stowed antenna into position and be demonstrating satellite reception services within an hour of hitting the site.

In the LNA technology area the battle lines formed around the **SCI** 50 dB gain units and the **DEXEL** 30 dB gain units. SCI's Tom Hunpheries (3425 Kingsley Rd., Garland, Texas 75041) fresh from the CATV price wars was battle weary and ready to make his mark on the private or low cost terminal market. Art Kawai of **DEXCEL** (2285-C Martin Road, Santa Clara, CA 95050) had just prior to SPTS announced his firm's interest in the private/low cost marketplace and he had a new 30 dB gain package on hand. The pricing of the LNAs on hand and shown varied from just under \$1k to up over \$1,300. SCI's Hunpheries made a plea in his seminar lecture session that small terminal buyers not get 'taken' by purchasing less equipment than was required to get the job done. **DEXCEL**'s Kawai and Yozo Satoda suggested that they would be happy to provide GaAs-FET devices to serious experimenters who wanted to work on their own LNA designs.

H. PAUL A SELL OUT

The Seminar was divided up so that the 'serious technical types' could attend a series of 12 satellite-microwave TV mini-symposiums staged by noted lecturer and teacher H. Paul Shuch, or attend the 'main program' in the auditorium at South Oklahoma City Junior College. Because of the overflow crowd, the lecture room set aside for Shuch was about 35% of its needed size. This resulted in a jam packed room plus an overflow crowd that had to go next door and take in the Shuch sessions on a pair of video monitors hurriedly patched into the color camera videotaping the Shuch sessions. The interest in videotaping (for their own use) the full set of sessions (both the Shuch sessions plus the regular full sessions; nearly 30 hours in all!) completely surprised us. We invited attendees to bring **their own** 1/2 inch machines and SPTS provided a set of baseband and RF feeds in a special room designated for this purpose. The feeds ran live and parallel to the sessions in the main auditorium. At one point we counted 52 attendee VTR machines purring away in the taping room which worked out to one person in ten attending the seminar lugging with his VTR machine and all of the attachments. Machines were hauled from as far as Alaska to tape the proceedings!

Virtually all of the sessions were very well attended; the 350 seat auditorium was seldom more than 10% empty and often was filled while the Shuch sessions attracted 100+ people through the full sessions. Videotape playbacks of the Shuch sessions, through the in-house distribution system, exposed Paul's lectures to hundreds more.

Some seminar lecturers such as Taylor Howard, Robert Coleman and Oliver Swan, used videotape of their installations to highlight their lectures. Other such as Peter Zilliox of **DALSAT** (he spoke on the history of satellite communications and the way satellites operate), **COMPUCON**'S Dan Yost (speaking on terrestrial interference and how you cure it or avoid it as the case may be), **DEXCEL**'s Yozo Satoda (speaking on the geometry of LNA design) made good use of

slides and other graphics. All in all it was a very visual (and video oriented) show. Yozo Satoda did an especially fine job explaining the intricacies of the LNA and broke the crowd up by relating a conversation he had with a seminar attendee. "This fellow came up and said that he had to put in an earth terminal at his home ... to prove to his wife that he still loved her. I guess that this indicates that the microwave technology world is really here now!"

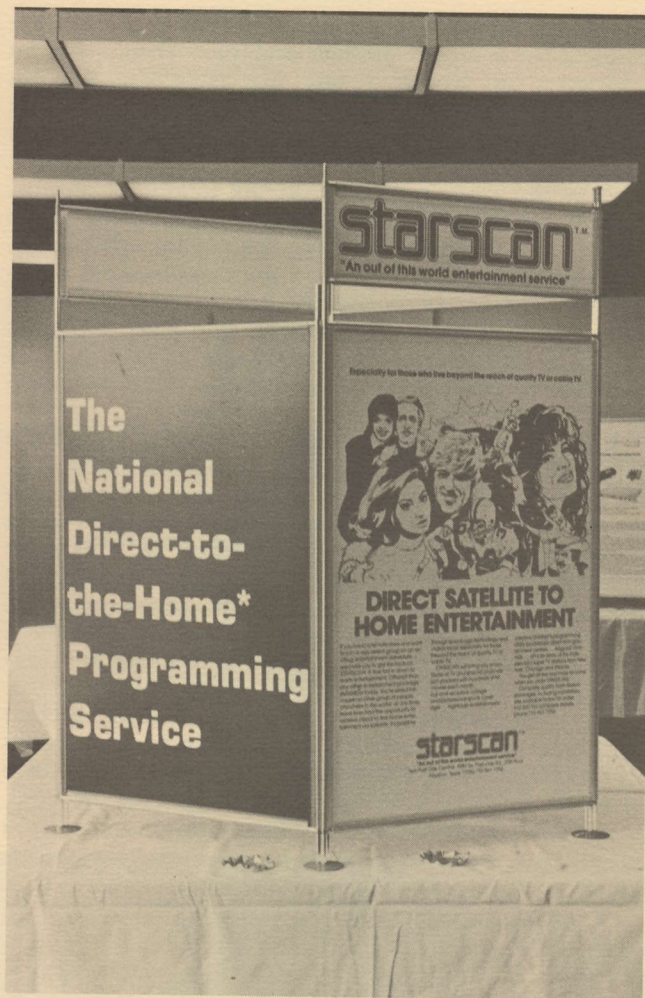
PROGRAMMING QUESTIONS

Long before the end of SPTS '79 it became apparent that the obstacles before us for the development of a national marketplace for low cost satellite TV services was not in the technology area. Several speakers openly suggested that if the 1979 summer SPTS was proclaiming that a \$4,000 earth terminal was 'here' that by the 1980 mid-year session that price might well be \$2,500.

Programming, or the legal right to access it and a comfortable, economic way of controlling what could and could not be watched by private terminal operators was clearly the big issue ahead. HOMESAT's Richard Campbell reported on their pioneering efforts in obtaining viewing agreements for the customers for their Homesat terminals. HOMESAT pays, up front to the program supplier, from one to three year's advance payments for the programming services selected by the private terminal buyer. However during the course of SPTS it became apparent that not everyone of the programmers on SATCOM were ready to accept that approach. Some simply, it was suggested, did not want any private terminal customers and they were either refusing to accept such contracts or alternately they were purposefully pricing their services out of the marketplace to discourage such customers. For an update report, see **Program Permission/Licensing** in the Programming Section of this issue. Several attendees were moved to suggest from the floor that if the services did not recognize the private terminal viewers and develop rational, fairly priced service agreements for these viewers, that all they were really doing was encouraging theft of their services. One attendee noted "Anyone who opens up a beautiful new candy store in Harlem, stacks goodies in the windows and then charges \$10 a pound for the sweets is just asking to have his window broken...".

Clifton Gardiner of the STARSCAN division of Gardiner Communications Corporation took the occasion of the Seminar to announce formation of a National Registration Bureau of Home Satellite Services. As the promotion sheet for the Bureau notes: **Its primary purpose is to keep interested individuals fully informed and to maintain a continuing record of all terminal owners and programming services being received so that terminal owners, as subscribers of a legally cleared service will have assurances of quality direct-to-home terminal programming, without interruptions. This can only be accomplished through controls that will provide assurances to premium channel users and producers of programming that copyright interests are being protected."**

The Bureau's concept is that by registering your



SATELLITE TO HOME - Starscan's direct (satellite to you) home entertainment package includes offerings of premium service channels, indie stations and a variety of lower-cost services such as religious and specialty programmed channels.

private terminal you will have indicated your **willingness to pay** for selected programming services **if and when** the (premium) programming service operators decide that they are ready, willing and able to deal with the private terminal market.

At least one premium channel service operator appeared at SPTS to announce that they were ready to accept private terminal contracts at a rate of \$96 per year for their service. Al Parinello of Warner's **STAR CHANNEL** (212-484-6707) reported his premium service channel (transponder 5 on SATCOM F1) had already signed up its first private terminal viewers. The \$96 rate (paid annually in advance) works out to \$8 per month which is the 'average' rate paid by cable television subscribers for their **STAR CHANNEL** service. As good as this news for the attendees, it provoked the secondary question of 'the rate structure itself'. The logic behind the charging the normal cable rate, from the premium programmer's point of view, is that the private terminal operator/owner is a retail user of the service; not unlike the cable company

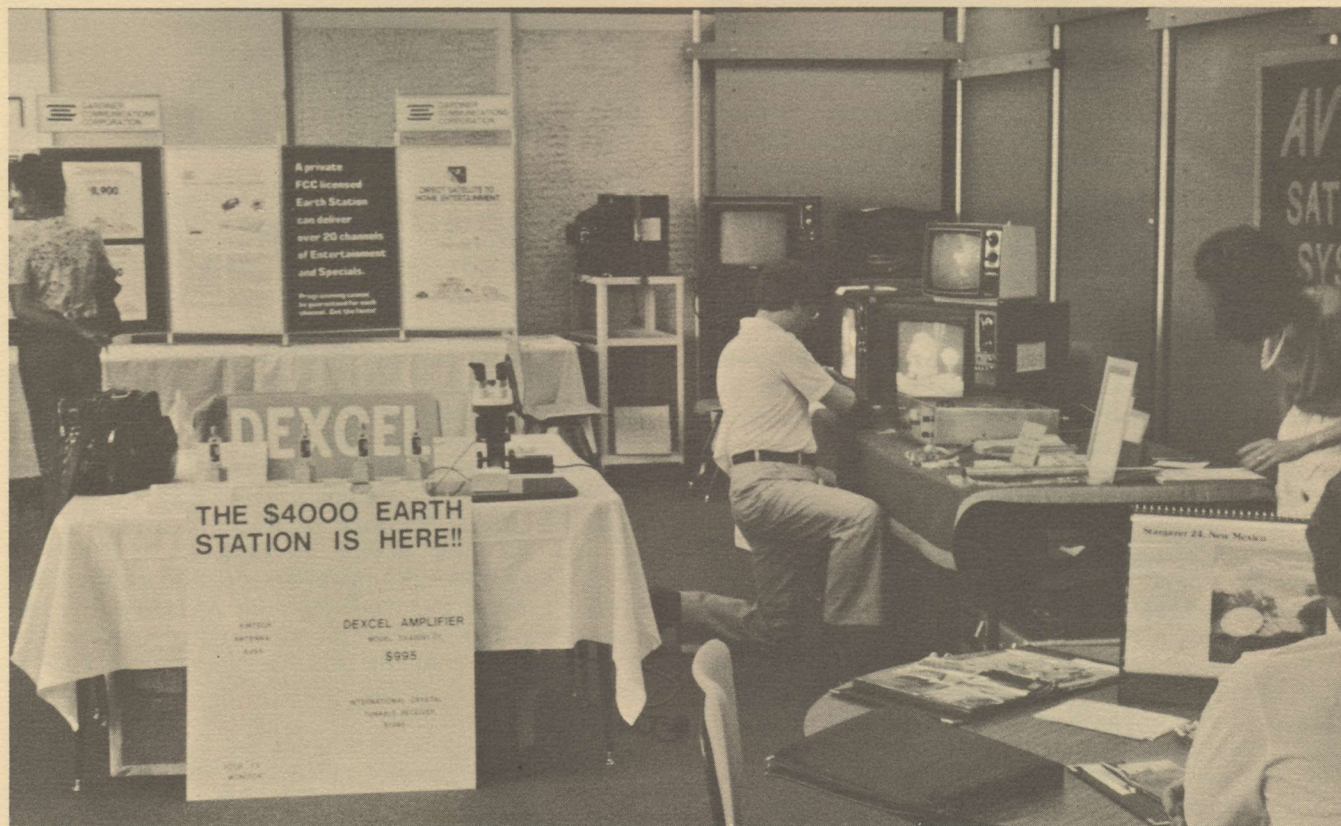
customer. In short, a private viewer is a user, not a re-distributor of the product and thus should not be entitled to the 'wholesale rate' that cable firms buy the service for, and then mark up for resale purposes. The wholesale rates range in the \$3.50 to \$5.00 per month region.

From the viewpoint of the private terminal operator, the rate charged should reflect that unlike the cable customer who spends nothing for capital equipment, the private terminal operator puts out several thousands of dollars to receive the service and he should therefore (like the cable operator who does the same thing) be entitled to a 'wholesale rate'. Through all of the floor to podium discussion ran the 'Harlem Candy Store' theme.

If the charges currently being suggested for private terminal reception of premium service channels (i.e. STAR CHANNEL and others that exist primarily on recent movies and specials created for pay cable services) were debated, the charges in effect for satellite reception of non-premium services were ill understood and hotly questioned. Sel Kremer of Southern Satellite Systems (918-664-4812) presented the side of a established common carrier that is bringing an independent television station to the bird. "Our tariff calls for an annual fee of \$60 per private terminal" noted Kremer "and this is to be paid in advance". Kremer maintained that because of the costs of accounting and keeping proper records for the FCC, that they simply could not offer a lower annualized

rate. He did suggest that the same \$60 per year would also hold if the private terminal had **up to 50 neighboring homes hooked up** (the CATV rate is at or under ten cents per home per month or \$1.20 per year) to the terminal. "This really is a case of a minimum charge, which gets out of line only because the minimum charge is being absorbed by a single viewing location". Kremer touched on a secondary question that missed the attention of most attendees (since they do not have the background of the cable industry); copyright. Under the 1976 Copyright Law adopted by Congress and signed by the President, any facility taking a common carrier delivered television broadcast signal into a **distant point** is required to (1) file their existence with the Registrar of Copyrights, and (2) pay an annualized fee of (again, a **minimum**) of \$60 per year for the 'right to view a distant television signal'. So when you add the two numbers together, the common carrier minimum fee of \$60, and the annualized 'minimum' copyright fee of the same amount, you are suddenly paying more per year to watch twenty four hours per day of Ted Turner re-runs of Lucy than you are paying for 12 to 18 hours per day of first run STAR CHANNEL movies from Warner!

Shades of the Harlem glass-front-window candy store. SPTS '79 had it all, and SPTS '80 sessions in south Florida in February and at Stanford University in June will be certain to carry on where both the technology and the uncertainties of a dis-orderly marketplace left off!



SET UP BEFORE THE CROWD - or clean up after a hectic day. A portion of the exhibit area (with Andy and Pat Hatfield of AVCOM right of center) during one of the infrequent periods when everyone but exhibitors were chased out to allow the exhibitors to attend to house cleaning chores.

PROGRAMMING PERMISSION & LICENSING

One of the more important results of SPTS '79 was the focusing of attention on the strange position both satellite programmers and would-be private terminal viewers find themselves in these days. On the surface there appears to be two willing partners looking for a preacher.

There was plenty of mis-information around ahead of SPTS as to which services would and would not deal with the private terminal viewer for cash money. We'll try to summarize here where private viewers stand (or sit as the case may be) with each of the suppliers currently on the bird.

The leader in the field, by virtue of systems sold and installed to date and by virtue of having been the first to enter the playing field, is **HOMESAT**; the Scientific Atlanta subsidiary formed last April to sell home satellite terminals to anyone with the bucks to afford the S-A package. As of SPTS '79 there were three such (4.5 or 5 meter) terminals licensed, installed and operating. The first three included a very large cattle ranch in New Mexico, a dis-satisfied fringe area TV viewer in Missouri and a TV sports nut in South Carolina. FCC licenses for all three were granted just ahead of SPTS and at about the same time as the FCC granted these licenses it let it be known that in the future "private satellite terminal licenses would be routinely granted" by the agency. **'Routinely granted'** is a key bureaucratic phrase; it means no more hassle, extra delays or problems for applicants who happen to want to use the satellite terminal for reception at a single home versus using it to feed hundreds or thousands of homes as CATV systems do.

Since SPTS several additional **HOMESAT** installations have gone ahead, and the tempo of activity is reaching a fever pitch according to S-A's Dick Campbell. Just ahead of SPTS another formidable competitor entered the fray; Gardiner Communications Corporation fielded a new division called **STARSCAN** (two Post Oak Central, 1980 South Post Oak Rd., Suite 2040, Houston, TX 77056). Heading up the new **STARSCAN** operation is ex-FANFARE person Sandy Freeman. Both **HOMESAT** and **STARSCAN** were amongst the exhibit hoppers at SPTS and both were looking for customers.

During SPTS **HOMESAT**'s Dick Campbell, in response to a floor question, said that **"no, S-A was not in the business of helping non-HOMESAT customers obtain the necessary contract authorizations with the various program suppliers"** while **STARSCAN**'s Freeman and Clifton Gardiner responded that **"yes, they would help would-be private terminal operators obtain the necessary agreements with the software suppliers"**. To accomplish this, **STARSCAN** has created something they call the 'National Registration Bureau for Home Satellite Services' (713-961-7352). The NRB/HSS collects \$10 in front from you and registers your home terminal. You fill out a piece of paper indicating that you are "willing to pay the tariff or contract rates" for various services you select "provided the services themselves are willing to let you take their services". The **STARSCAN** NRB/HSS recognizes that at least today not everyone of the 19 programming channels available on SATCOM F1 is willing to grant you permission to view their programs; even for a

fee.

Which was the bottom line after three days of intensive seminar sessions at SPTS. Some of the services were willing to grant permission to view at no charge; others wanted a modest (one time or annual) fee. Still others wanted healthy annual fees and finally still others didn't want any money. They also didn't want you watching them. **Period.**

STARSCAN recognized that at least for now very few of the services which will accept private contract viewers, for a fee are ready, willing or even able to handle you on a one to one basis. **STARSCAN** caught the drift of this from Dick Campbell's pioneering work at **HOMESAT** where Dick created the 'bulk buy concept'. The bulk buy works this way. **Homesat** sends a flat amount to the cooperating software programmers in advance for one years' service. The flat amount is computed on the basis of blocks of customers; a 100 unit customer block is non untypical. Let's take a real world example. The new Entertainment and Sports Program Network (**ESPN**) has an established rate of \$1.40. That's for life. You pay them \$1.40 one time and you have their permission to watch **ESPN** programming on transponder 7 for ever. Your forever or their forever; which ever comes first.

Only **ESPN** (which gets away with this 'low rate' by the way because they are advertiser supported) does not want to hear from you with a \$1.40 check. They probably spend \$5.00 just opening your envelope, looking at your check and letter, and then deciding what to do with it. So the bulk buy was born. **HOMESAT**'s Campbell sent them a check from **HOMESAT** for \$140. That's one hundred forty customers, in advance. **STARSCAN**'s Freeman wants his operation to operate in a similar fashion, and the NRB/HSS is part of that scheme. Only **STARSCAN**'s approach through NRB/HSS is that any private terminal operator, whether they purchase a terminal from parent corporation Gardiner Communications or not, can sign up for the services of their choice. The sellers being willing to sell of course.

At the moment it appears that none of the services available, at least those who are charging fees (we'll get to who is and is not shortly), really want to hear from you as a single viewer/terminal. **They can't afford to handle the paperwork.** This suggests that **STARSCAN** has a good thing going if the program suppliers who to date have been reluctant to allow private viewers to tune in will get on board with those who have agreed to accept private viewers. This may change; as soon (or if) it does, the full details on who to write to, what to say and how much to send will appear here. In the interim we suggest that if you are a do-it-yourself terminal person that you contact **STARSCAN**.

Both **STARSCAN** and **HOMESAT** are gearing up for aggressive advertising campaigns this fall. Most of the early advertising will be directed at regional publications (such as farm journals, etc.). Both firms are dead serious about the marketplace for commercially sold private terminals and both have at least some marketing program directed at aligning themselves with local people who will act as sales, installation or service outlets for their services. **If you are interested in representing a complete terminal packager, now is the time to contact both of these firms.** As big as the marketplace is, there is already direct competition between the two firms.

Not all of the activity is of course on this national level. Dick Campbell reports that since SPTS there have been **"numerous people in here looking for agreements with us to represent us in their areas"**. In another aligned area, several dozen regional firms have sprung up acting as 'packagers of earth terminal stations' just as Gardiner Communications does on a national level. At least one of these firms may be attracting interest at a national level which could have some impact on the FCC's willingness to deregulate earth terminal licensing this fall (see **COOP'S COMMENT ON PROGRAM—MING**, this issue). **Channel One, Inc.** (68 Avalon Road, Newton, MA 01752-1025) entered the marketplace last spring. In their sales brochure (see illustration here) **Channel One** makes the statement that **"No license (is) Necessary"**, and, **"Personal and private viewing of copyright material does not require a fee of license"**.

Channel One's also told the FCC, in a recent public release plastered throughout the television trade press, that they are **"challenging the FCC to come out and shut down a Channel**

Cable TV's Best Programs Are Relayed By Satellite

Enjoy Them All With Channel One's Earth-link*

If you love good TV, but have poor reception or a limited selection of local stations, then Satellite TV is for you. An Earth-link, at \$15,500, will capture the incredible spectrum of television programs now beamed at North America by an RCA communications satellite. No cable system carries the complete selection.

Why Satellite TV?

In the past, slow and expensive methods, such as airfreighting tapes to Cable TV systems, limited the distribution of good shows. Since 1975 however, satellite relays have permitted instant distribution with better

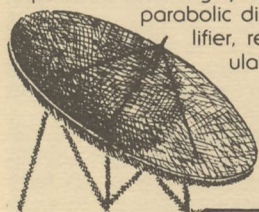
quality at substantially lower costs. As a result, Cable TV has grown dramatically.

Today the Cable TV operator can instantly tune in to satellite channels (called transponders) which carry programs as varied as Showtime, Praise The Lord, WTCG Atlanta, Madison Square Garden Sports, the U.S. Congress and more.

Anyone with the appropriate receiving equipment for the special satellite band can also tune in.

The Receiving System

Satellite signals are weak. They require a powerful receiving system, consisting of a parabolic dish antenna, amplifier, receiver, and modulator. The result—a



Technical description: Satellite transponders operate in the 4 GHz downlink band, at an EIRP of 30 to 35 dBW, depending on location in North America. Twenty-four transponders operate in 12 channels with two polarizations (vertical and horizontal). The Earth-link uses a parabolic dish antenna of narrow beamwidth and high gain. The dish focuses signals into a waveguide leading to a Low Noise Amplifier (50 dB gain). The amplified signal travels through hardline to a 3.7-4.2 GHz frequency-agile radio. The baseband output of the receiver is modulated to VHF channel 3, 4, 5, or 6.

broadcast-quality picture in your home, perfect for wide-screen TV. No ghosts, no snow.

A clear view of the southern sky, free from obstructions, is necessary. The dish must be able to "see" the satellite, which hovers in a stationary orbit, 22,300 miles above the equator.

Simple to Operate

An Earth-link comes with only two controls. They provide fingertip choice among 24 transponders.

Should you wish to switch from the RCA satellite to a Western Union satellite, to watch PBS or Johnny Carson perhaps, the antenna must be repositioned—a two-person, 45-minute job.

No License Necessary

The U.S. Department of Justice, in a filing before the FCC dated March 23, 1979, has taken the position that "existing laws do not require an FCC license to use a device that simply receives radio communications."

Copyright

Personal and private viewing of copyrighted material does not require a fee or license. Any intended use which goes beyond the home, such as trading videotapes, will require further guidance. Current copyright fees range from 1c to \$5 per subscriber per month.

Sharing With Neighbors

If your neighbor agrees to watch the



programs you have selected, then this limited form of sharing can be accomplished for little more than the cost of the cable. However, if your neighbor wishes to independently select programs, then he must purchase additional equipment which will add 65% to the installed price. (If a public way intervenes, permission must be obtained from the municipality).

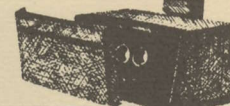
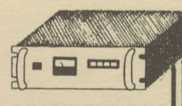
Condominiums and Motels

The Earth-link is designed for private homes. Channel One, Inc. has systems suitable for condominiums, hotels, resorts, bars, and so forth. Further information will be furnished on request.

Safe

Microwave signals from satellites are all around us now. This equipment is merely a receiving device. All outdoor electrical wiring is at low DC voltages and draws less than 10 watts.

*Earth-link is a trademark by Channel One, Inc. for its Satellite TV receiving system. Note: Drawings not to scale. A wide-screen TV is an optional extra.



One installation (someplace in) California. Channel One wants to make a test case of their contentions ("...no license is required", "no copyright fees need be paid").

The confusion in all of this stems from several quarters. During the FCC's spring of '79 "comment period" on the now promised deregulation program for earth terminal licensing, the U.S. department of Justice took the occasion to file a 'brief' in which they said (in essence) "**Hey FCC ... there is no question about whether you should allow TVRO terminals to be installed without licenses; our view of the 1934 Communications Act (as amended) states that you have no authority to license any receiving stations in the first place.**" This sounds very impressive since it comes from the DOJ. Unfortunately, the DOJ files statements similar to this on all sorts of issues and as a rule the DOJ "comments" get ignored by the FCC and everyone else who receives them. That probably frustrates the young DOJ lawyers who spent several weekends researching their comments but that's the way it works in D.C. these days. Channel One's Fred Hopengarten, a graduate of the 1972 class of Harvard Business School and an attorney, seized upon the DOJ filing none the less and issued his 'challenge' to the Commission.

Whether the FCC has the right to 'license' earth receive terminals is, hopefully, a moot point; assuming they do go

ahead and deregulate as they have promised. A bigger question, the one hanging up some suppliers at the moment, is copyright.

A copyright is normally thought of as a property right; the creator of something, whether the author of a book, creator of a screen play, or songwriter has the protection of the law. He (or she) is guaranteed, under copyright law, that no one else shall profit from their creation without compensation to the creator. Only copyrights, like movies and plays and songs, are not always passed along with the rights of reproduction or use of the works themselves. In fact, more often than not the copyright holder is not the person who produces a movie or releases it. It may also not be the person who created it either; since copyrights are bought and sold in the marketplace like any other commodity. HBO will be our example. They negotiate with a movie producer for a movie. Say **Smokey and The Bandit**. They reach an agreement wherein HBO has the right to distribute Smokey to its affiliates for re-sale, for a fee. The agreement which HBO and Smokey's producers sign specifies how many times Smokey will be shown by HBO, where in turn the HBO affiliates may show it (bars and clubs are ruled out), and what money HBO will pay for each time Smokey is played. The people who produce and distribute Smokey may in turn have a second

PROGRAM SUPPLIERS WHO WILL DEAL

Transponder	Service	Status of Private Terminal Agreements
1	KTVU from Warner	Unknown. KTVU's transponder 1 has had three owners in the past four months. Prior owner SSS is hung up on Copyright questions; new owner Warner is already dealing for STAR CHANNEL.
2	PTL	No charge, or, one time 'mailing charge' of around \$2 - 3.00.
3	WGN from United	Tariffed at \$60 per year; reported to be accepting agreements from HOME—SAT and possibly others.
5	NICKELODEON	Given as bonus to STAR CHANNEL; see transponder 11.
6	WTBS via SSS	Tariffed at \$60 but hung up on copyright ramifications. Reported to be returning applications because of lack of copyright clearances.
7	ESPN	Entertainment and Sports Network; flat \$1.40 lifetime fee. No problems.
8	CBN	No charge or one time 'mailing charge' or around \$2 - 3.00.
9	C-SPAN Madison Square Gard.	HOMESAT says there is no charge; cable operators pay 1 cent per home per month. It not free, probably very reasonable. Unknown.
10/12	SHOWTIME	Accepting \$132 annual fee that includes Southwest Regional Sports package left from FANFARE days on transponder 16.
11	STAR CHANNEL	Accepting annualized fee of \$96 and bonuses with NICKELODEON (transponder 5)
13	KTBN from Trinity	No charge or one time 'mailing charge' of around \$2 - 3.00.
17	WOR from Eastern	HOMESAT says posture similar to WTBS/SSS; STARSAT reports accepting tariffed fee of \$60 per year.
21	SPN	No charge; letter permission required.
22	Modern Motion Pix	Unknown; logic suggests it would be free.
22/24	HBO	Not accepting contracts; does not want private viewers at this time.
23	HBO's TAKE-2	Same policy as 22/24.

(third, etc.) agreement with the copyright owners which limits where they may distribute it or how they may distribute it.

Bars and clubs are usually prohibited points of showing simply because they have no 'protected gate'. A protected gate is one where somebody is ultimately responsible for seeing that everyone who wants to see Smokey is accounted for, and pays for, that viewing. Customers wander in and out of bars; bars are not licensed as movie houses so they can't set up a 'gate' per se and collect entrance fees. The copyright owners don't like unprotected gates so they simply exclude them from the distributor agreements and the distributor who sells to HBO in turn restricts HBO from showing Smokey in such places. The rule of thumb is that if you can't count people watching the event (or able to watch the event), and, collect money for each potential (or real) viewer, then you don't show the event.

Private terminals are viewed by the right's owners as an unprotected gate. They have tuneable receivers, the ability to tune in and tune out at will, the ability to fill up their living rooms with dozens or indeed hundreds of people. As Al Parinello of STAR CHANNEL said at SPTS "...private terminal viewers don't concern us; yet. If everyone of you in this room had a terminal operating and if everyone of you

were tuned into STAR CHANNEL, out loss would be the equivalent to a very small cable system. What worries us though is that you all have friends!"

At the moment HBO will not accept any private terminal contracts. Dick Campbell of HOMESAT reports HBO has simply returned HOMESAT year-in-advance payment checks for the first set of HOMESAT private terminal customers. "HBO", says Campbell, "is not being hard nosed about this. They are feeling the pressure from the distributors and the copyright owners". Which is another way of saying the HBO feels that they cannot afford to accept any checks for private terminal viewing because of what that might do to their existing relationships with existing program suppliers. HBO is also making noises about 'scrambling' their satellite signal; something we'll look at in some detail in our November CSD.

Yet at SPTS '79 Warner's Al Parinello said "STAR CHANNEL has three private terminal viewers and we'll sign up as many as want the service who are willing to pay the rate". The rate is \$96 per year but that includes Warner's 13 hour per day NICKELODEON service (transponder 5) for children as well. SHOWTIME (transponders 10 and 12) is similarly reported accepting private terminal agreements. If the two non-HBO movie services are willing to accept private terminal

viewers (and in a given three month period the major release movies will appear on **all three** services), why not HBO?

Some theorize that HBO has something else in mind. Maybe a service designed and dedicated for the private terminal viewers. Maybe even on another satellite; that is, one away from the 'temptations' offered by the 'cable satellite'. We'll look at that in the November CSD as well.

PROGRAMMING CORRESPONDENCE

STAYING LEGAL

It was a pleasure attending SPTS '79. Like many young and aspiring companies that we met at the Seminar, we intend to market and service TVROs to the general public. We have put together a professional brochure, have our own portable TVRO on a trailer, our own place of business, and will begin advertising in this area shortly. However we have some questions regarding being very sure that our approach to marketing is not going to get ourselves or our customers into trouble.

- 1) What steps should we take to protect us and our customers from legal problems at the local, state or federal level?
- 2) What 'key' statements should appear in our advertisements, sales contracts and agreements to keep us out of 'hot water'?
- 3) What potential problems could stem from the public ad campaign and exposure of TVROs to the public?

Robert L. Young
Satellite Television Systems
Box 11249
Reno, NV 89510

Very important questions indeed and we'll attempt to answer them here. At the local level the only concern should be local zoning laws. Many communities have local ordinances limiting the height of structures on the property and numerous amateur and CB enthusiasts have had problems with these ordinances. The low profile of a TVRO antenna however should not be a problem here. If a customer of yours should decide to inter-connect other homes to the 'master TVRO antenna' however, he needs to be sure that under local ordinances he is not engaging in a 'business activity' within an area where only residential housing is permitted. At the state level, the only possible problem might occur in states such as California or Oklahoma where we are aware that 'theft of telecommunication laws' are on the books. Under these laws it is an offense to engage in the 'theft' or 'reception' of telecommunication signals not intended for the user. The same law in the two states noted also makes it an offense to 'assist others' in receiving telecommunication signals not intended for the user. The clear solution here is to engage in reception for only those signals for which the

user has been granted authority to receive. At the federal level under the now-current FCC rules every operator of a TVRO terminal must have both a license to construct and operate the terminal (from the FCC) and either the written permission or some contractual authority of the various programming sources that will be received. Even if the FCC does away with mandatory full-blown licensing (see News Update this issue), written or contractual authority for accessing the various transponders will still apply. Anyone engaging in the sale of satellite terminals would, we believe, be smart to include a 'sign off' form in the paperwork in which the customer accepts the terminal as a satisfactory installation and in which it is noted by specific listing the transponders which the customer/user has received advance authority to access. In that way if after you leave the premises with check in pocket and the customer engages in reception which he is not entitled to you and your firm are not a party to the 'signal theft'.

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HELP WANTED

Can you please furnish information on 'Home Satellite TV Reception'? We moved to this area from Seattle where we had cable TV service and Home Box Office. Here between two hills we get two stations, sometimes. Often on one channel we get picture but no sound, or vice versa. We have traveled through Mexico and up the Alaskan highway and in both areas where there is population the TV reception runs to 3 or 4 channels and good quality color. So here in this great country of ours, only 100 miles from Seattle and 38 miles from Wenatchee (where they have cable) we get garbage! We have asked TelePrompTer of Wenatchee about the chances of getting service out here and they say never. We need some help!

Rhodo Schinman (and alot of neighbors)
Star Route, Box 73-S
Leavenworth, WA 98826

Because of the widespread distribution of our STT 'Satellite Study Package', we receive dozens of letters per month from people in the same fix as Mrs. Schinman. Naturally many end up getting started in satellite TV reception through the 'Study Package'. Most however are non-technical and they just want to be able to get TV like the big folks do. We are considering simply running a 'Help Wanted' listing in CSD each month and allowing the competitive forces of the readers come into play. In effect, these are sales leads for all of your fellows engaging in the sale and service of satellite receiving systems. Anyone have any objections to this approach?

AUDIO TERMINALS

How about satellite audio services, like AFRTS programs? These must be far simpler to receive than video since the overseas bases I am familiar with seem to get by with much smaller antennas. Can you furnish information on frequencies, powers, modulation standards, etc.?

Jon B. Hagen
Arecibo Observatory
Arecibo, P.R. 00612

Audio-only (or narrow-band only) terminals are, we feel, about to bust out. Up until now TV has held the limelight simply because of the extra attraction of getting pictures with the sound. The audio-only terminals are indeed far

simpler to build and operate. On transponder six of WESTAR I (99 degrees west) there are typically four separate NPR (National Public Radio) audio channels in operation. Using an SPCP (single channel per carrier) format that is FM with a 75 KHz peak deviation and a 15 KHz maximum audio frequency, one of the best tricks is to downconvert the transponder 6 range (3900 to 3940 MHz) to not the standard 70 MHz i.f. but rather to an i.f. of 88 to 108 MHz. This allows you to plug the i.f. output directly into a standard (good grade) FM tuner/receiver and tune in directly the FM audio signals on the standard tuner/receiver. We have several enthusiasts working on this project and expect to have a couple of articles on the subject in the next few issues. If you are involved in this activity, we'd like to hear from you as well!

DELIGHTED IN CHILE

I was very delighted with the tapes that just recently arrived from STT showing the Jupiter Fly-By of Voyager I. Do you have tapes available of the Jupiter Fly-By from Voyager II?

Adolfo Araya Gauna
Santiago, Chile

STT does have a 12 hour BETA-2 or VHS(LP) set of videotapes available from the Voyager I Fly-By of last March; but none of the Voyager II. Readers interested in astronomy, science classes et al who would benefit from the excitement of the 12 hours recording the Voyager I Fly-By pass are urged to contact STT directly at P.O. Box G, Arcadia, OK 73007.

ADVANCE PROGRAM SUGGESTED

I was a registrant for SPTS '79 and while pleased with the show, an advance seminar registrant should I believe have access to an advance program schedule. My interest in SPTS '79 was to gain a better understanding of the marketplace and product development. A program of the Seminar, prior to arrival, would have helped me better plan my own arrival and travel plans to ensure that I was on hand for the sessions that interested me most. Unfortunately, three seminars (The Private Terminal Markets 1 and 2, and, Private Terminals and the Legal Implications) were missed by travel plans that had been pre-arranged. I am interested in the 1980 seminar series and would appreciate receiving information, when available, on their format and content.

H. MacLean
Market Analyst
ELETROHOME LIMITED
Kitchener, Ontario

Agreed. We kept the seminar by seminar session line-up under wraps until the very last minute at the first SPTS. We'll have a broad outline here in CSD for the two months prior to the first SPTS in South Florida in February and again for the Stanford Seminar in June. For those who missed any sessions (or all, in case you were among the more than 200 who wanted to attend but could not because we were sold out!), every SPTS session was videotaped and we have more than 30 hours of color videotapes available at reasonable pricing. To obtain a list of the videotapes available, on VHS (LP) and BETA-2 format, write: Tape Time, STT, P.O. Box G, Arcadia, OK 73007.

NATIONAL SPACE INSTITUTE

Satellite Week (publication), in its very first issue, reported on a satellite seminar which you were scheduled to hold in Oklahoma in mid-August. It quotes you as saying that 'the \$2,000 satellite TV receiver is here now, and a \$1,000 receiver is expected by next year'. The National Space Institute, a non-profit group concerned with promoting a strong comprehensive space policy, would like to know more about the apparently growing market for satellite TV. We would be grateful for any information you can provide concerning the

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past and future growth of TV satellite services in general. I'd be most interested in learning about the results of your first seminar.

Courtney A. Staad
Special Asst. / Policy
National Space Institute
1911 N. Fort Nyer Drive, Suite 306
Arlington, VA 2209

The NSI was founded by Dr. Wernher von Braun and on it's Board of Governors is our front cover hero Arthur C. Clarke. They put out an interesting (if not savvy) publication which readers might wish to investigate.

TVRO OWNER'S ASSOCIATION?

Can you please tell me of any private TVRO terminal owners' clubs or associations, which I can join? I would very much like to see a group started for the exchange of information, to root out dishonest hobbyists, to work towards legalization of our hobby, and to enable us to establish and maintain a good healthy rapport with those who's signals we receive so hopefully they will not take unfortunate actions against us in the future.

Paul Manning
4426 Arbutus Street
Vancouver, B.C. V6J 4A2

During SPTS '79 there was the first (faltering perhaps) step begun in that direction. A steering committee made up of about a dozen attendees met to discuss how present and prospective owners of private satellite terminals might pool their resources to establish just such a group. The group is led by Michael Salem (225 W. Lindsey, Norman, Oklahoma).

NEW ICM TV-4200 SATELLITE RECEIVER

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- Output levels compatible with video monitor or VTR input.
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- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.

10 N. Lee Oklahoma City, Ok. 73102 405/236-3741



Mike is an amateur radio operator (N5MS) and an attorney and from our viewpoint he should be well qualified to provide the guidance required to get such a group off the ground. As things now stand Michael needs a showing of support and interest, and hopefully by the time we get to SPTS '80 in South Florida in February the group will be prepared to stand up and be counted.

STOPPING THE SHOW

I attended the Oklahoma City SPTS and was amazed at the amount of information I was able to acquire. This was a good program and you deserve credit for the courage to do it. It surprised me that some interests wanted to stop the Seminar before it began. They might as well try to stop a hamfest where they teach how to build shortwave receivers! My main interest is the potential for selling legal systems in our area and I am presently talking to all of the prospects I can locate. It seems as though the hardest nut to crack will be the programming rights aspects of the system. We'll probably come to the Miami SPTS and look forward to seeing everyone there ...

Al Bruan
Alaun Engineering
Montrose, CA 91020

We'll keep track of the programming rights question month by month, but see it starting to shake out.

TAKING DISCOUNTS

I was excited by the promotion sheet on Coop's Satellite Digest and wanted to be one of the 'Pioneer Subscribers'. Only one thing missing...since Pioneer Charter Subscribers are entitled to a 10% discount on their purchases from STT how do we take that discount? I ordered the Swan Spherical Antenna Manual today from Arcadia today (\$30) and the 'Satellite Study Package' from the Napa address (\$16) but there is no place on the order forms to take the ten percent discount.

L. Robert Hoffman
(someplace in) Mexico

We've given that problem considerable thought. If we place an actual line on all of our many order forms where the buyer can subtract ten percent from the order because he is a 'Charter Pioneer Subscriber' to CSD, we'll end up with almost everyone taking the discount on everything whether they are entitled to it or not. The 'Satellite Pioneer Certificates' are being prepared, will be mailed during October and instructions for discount taking will be included. Oh yes, we are 'sold out' on Charter Subscriptions so if you delayed sending it in until now, the full price applies. Reader Hoffman is, like many other expatriate Americans living in Mexico, now building a private satellite terminal to get a bit of Norte Americano video into his sleepy Mexican adobe.

TAPES FROM SPTS '79

It was a pleasure meeting everyone at SPTS as well as being informed of the developments in the private terminal market. As a Systems Engineer for HBO, my particular interest was in the technology of the equipment for home satellite TV reception. In trying to coordinate my time between the tape room sessions, and the main theatre talks there was quite a bit of information I had to miss. Please supply the video tapes listed here for my further study. I attend, as part of my job assignment, many seminars and conventions within this field and let me say that SPTS '79 was on a very well coordinated and highly professional plateau.

Daniel A. Rutman
Systems Engineer
HBO - Home Box Office
New York, N.Y. 10020

One of the most popular sets of tapes is the 8 tape lecture series from H. Paul Shuch on satellite-microwave TV technology. STT has this 8 lecture series on VHS (LP) and BETA-2 for a special package price; see advertisement on outside back cover of this issue.

PERMISSION TO VIEW

I am constructing an earth station and would like your permission to receive your program via RCA SATCOM FI, transponder 21. Your assistance will be greatly appreciated.

Edmund R. Rogers
West Haven, CT 06516

I am writing in regards to obtaining authorization to receive program material from SATCOM I, transponder 21. Please include any information regarding licensing TVRO stations.

Gerald J. Godfrey
Buffalo, N.Y. 14202

I would like to build a TVRO and I would like your permission to receive your program 'Satellite Magazine' which airs on RCA SATCOM I on transponder 21, per your 'Home Satellite TV Reception' Handbook.

John Dubry
Yucaipa, CA 92399

We have received several dozen letters in recent weeks along these lines, and as page 26 of 'the Handbook' states we generally give permission to those who write for same to tune in our weekly 'Satellite Magazine' program on FI, transponder 21. The schedule for the coming week's programs appears in this section of CSD. Our permission extends only to our program; we have no authority to extend permission for other programs seen on transponder 21, nor for other transponders. However, Satellite Program Network (P.O. Box 45684, Tulsa, OK 74145; attention Kip Farmer) makes no charge for receiving their transponder 21 programs and they should grant you a letter of blanket authority to tune in their program schedule which now runs more than 20 hours per day if you will write them directly.

PERMISSION TO BROADCAST

Please advise immediately if you are interested in having Satellite Magazine (program) carried on a regular television broadcast station and if you have the program right to do so. SPN has received a request to be carried on a non exclusive basis by an independent TV station.

Lynn Farmer
Program Director
Satellite Program Network
Tulsa, OK 74136

We of course granted the permission. If indie stations

start taking program feeds from SPN, a whole new non-cable audience will begin having access to satellite distributed cable programming. The possibilities fairly boggle the mind!

RESELLING THE HANDBOOK

Having just read your book, Home Satellite TV Reception, and finding it very informative and easy to understand, I would like to make a simple business proposal. I am in the mail order information and electronic kit business. Most of my customers are involved in CB radio, but I am sure many would be interested in buying your book. I would like to know if I can resell the book on a drop ship basis, or, by stocking and reselling from here. What say?

Lou Franklin
President
C.B. City
Woodland Hills, CA 91365

The Home Satellite TV Reception Handbook is generally not sold as a stand alone product; it is a part of our 'Satellite Study Package' which also includes our 22 by 35 inch two sided four color wall chart showing satellite locations and operations. The price for the 'Satellite Study Package' is \$13 in U.S., \$16 in Canada and \$20 elsewhere via surface mail; U.S. funds. More than 10,000 of the packages have been sold so far this year and in fact most of the people interested in satellite TV have come into the field through the 'study Package'. For the time being, we will continue to be the sole distributor for the package.

COOP'S SATELLITE MAGAZINE SCHEDULE

With the assumption that RCA allows transponder 21 to remain with SPN (Satellite Program Network) through the month of October, here are the **SATELLITE MAGAZINE** program schedules for October and early on into November.

Satellite Magazine is produced by STT's Bob Cooper, is one hour per week, and is scheduled to run at 12 noon eastern time (etc.) on RCA SATCOM FI, transponder 21 each Thursday. The program is cycled so that each program repeats for two weeks, resulting in two new programs per month.

Program Contents

Run Dates

Highlights of SPTS '79 including Yozo Satoda of DEXCEL, Inc. (on LNA design), Al Parinello of STAR CHAN—NEL and Sei Kremer of SSS (on program rights agreements for private terminals) and Oliver Swam on Spherical antennas.	9-27, 10-04
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Dana Atchley hosts with guest Wayne Kines who is involved in design and operation of the world's largest cable	10-11, 10-18
----------------------------------------------------------------------------------------------------------------	--------------

television network, operating in rural Manitoba, Canada.

Paul Shuck excerpts from SPTS '79 covering superhetrodyne downconversion techniques.	10-25, 11-01
--------------------------------------------------------------------------------------	--------------

Paul Shuck excerpts from SPTS '79 covering modular TVRO receiver designs.	11-08, 11-15
---------------------------------------------------------------------------	--------------

If SPN is not allowed transponder 21 on a regular basis (see other reports this issue on failure mode problems with SATCOM FI and their impact on FI), we must assume that that Satellite Magazine program series may, like other SPN offerings, be off the air until RCA's FIII bird is launched and made operational sometime after January 1st.

PROMOTIONAL DATA AVAILABLE

Alternate Information Sources

Satellite Week (1836 Jefferson Place NW, Washington, D.C. 20036) is a weekly first class mailed newsletter providing extensive coverage of legal, WARC, programming, satellite operations news in abbreviated format. Published by same folks who have produced Television Digest for 34 years; recommended reading for serious enthusiast but expensive (\$327 per year).

Satellite News (8401 Connecticut Avenue, Washington, D.C. 20015) is issued every two weeks, mailed via first class mail, providing coverage of programming and some operational aspects of the satellite television business. Subscription price is \$147 per year.

INSTANT REPLAY is an unusual videotaped 'magazine' produced in Florida by a very talented crew that attempts to give you a monthly 'magazine on videotape' using video enthusiast news features compiled all over the world. Recently coverage of satellite activities (including SPTS 79) has expanded and we are told that satellite terminals will be seen more and more frequently on the magazine-produced-on-videotape in the future. For full information including subscription data, write 4149 Bonita Avenue, Coconut Grove, FL 33133 (305-666-6787).

For fans of magazine articles dealing with satellite television reception, here is the current crop of such articles:

73 MAGAZINE - thirteen page feature written by Coop way back last February will appear (according to advance notice) in the November issue of this popular amateur radio magazine. For readers who are hooked on current-only material, our apologies 'in front' for the semi out of date nature of this material. That's the publishing biz! **VIDEO** - a very good outline of what home satellite TV is about, originally written in June of this year, appears on page 44 of this snazzy six-time-a-year newsstand distributed publication. Same issue has interesting piece on Ted Turner's WTBS, VHS versus BETA format

operation, video hardware tests. Front cover has 'three headed man' puzzled over VHS versus BETA format; front cover dated November. Article written by Coop (naturally!).

RADIO ELECTRONICS - Part three of a six part series scheduled for October issue of RE; the wrap up of the introduction to home satellite TV reception. Final three parts dealing with the mechanics of assembling the station, will probably not start before January however.

Those attending SPTS '79 saw the **NBC PRIME TIME SUNDAY** crew with Jack Perkins roaming around shooting videotape, conducting interviews and generally collecting material for what was expected to be an early-fall airing of the subject. Where is that project now? Producer Bob Eaton tells CSD that because another group at NBC did a three part mini-series on the NBC Nightly News on the overall subject of satellite television the week of September 17th, the PRIME TIME crew is simply uncertain when they will complete the private satellite terminal piece and schedule same for airing. As it now stands they have tape 'in the can' from SPTS in Oklahoma City, a visit to Coop's private (experimental) terminal, a visit to the Scientific Atlanta first full-blown private installation at the Bell Ranch in New Mexico and so on. Eaton feels that they may plan on running it on Synder's program around December first to 'coincide' with the launch of RCA SATCOM FIII. An earlier run is very unlikely. Watch you **TV GUIDE** listing for the Sunday night program and if we have sufficient notice, you'll read about it here in advance of the air date.

PROGRAMMING SERVICE CHANGES & ADDITIONS

ESPN LAUNCHES

A novel new service debuted at 7 PM eastern on SATCOM F1 transponder 7; the Entertainment and Sports Programming Network (ESPN). ESPN is promoted as a "24 hour per day sports channel" available through cable systems. The service is advertiser supported, and there is a one-time fee for becoming a viewer of \$1.40.

ESPN has had a checkered history; the service was due to launch last spring and in fact did make a few telecasts on transponder 7; primarily New England area college sporting events. Early indications were that the service would be a New England area regional service transponder with a mixture of sporting events from New England area colleges and Universities, plus some entertainment events of interest to that region. However during the late spring the ownership of the service changed hands to the present 'Getty Oil Company' backing and the concept for the service expanded to a full time, primarily sports service. A sampling of a typical day's programming is shown to the right.

Although the schedule shown here indicates a very full schedule, during the weekday daytime hours the service is often 'between programs' with a color bar pattern supered with the schedule for that day and the balance of the week. Creating a full twenty four hour sporting schedule on a seven day a week basis has its own problems not the least of which

is finding enough sporting material to fill the air time! As you might guess some of the 'events' televised are of marginal interest except to the participants and their close families. Overall however the service gets good marks for reasonably good production quality, a varied if not 'totally interesting' schedule and the reasonable life time rate of \$1.40.

A.M.

- 12:00 Sports Recap
- 12:30 Sports Hot Line (R)
- 1:00 Wednesday Night Fights
(Professional Boxing) (R)
- 3:00 NCAA SOCCER: Brown at
Boston University (R)
- 5:00 Women's Field Hockey:
Springfield at Boston College
- 7:00 World Classic II Arm
Wrestling from Las Vegas,
Nev.
- 7:30 IKF Kart Racing (R)
- 8:00 Sports Recap
- 8:30 Pony League Baseball
World Series
- 10:30 Babe Ruth Baseball World
Series

P.M.

- 1:00 NCAA Football Preview
- 1:30 Hall of Fame Lacrosse (All-
Star Game)
- 3:30 World Classic II Arm
Wrestling from Las Vegas,
Nev.
- 4:00 Women's Volleyball from
San Diego State
- 6:00 Sports Recap
- 6:30 National Baseball Congress
Tournament
- 9:30 Rugby Union (England vs.
Ireland)

BIRD OPERATIONAL NOTES

WARC - currently being held Switzerland will determine the shape of terrestrial and satellite frequency allocations for next twenty years worldwide. Preliminary meetings held over past several years indicate trends but few certainties in the satellite area. Out of WARC will come solid allocations or recommendations for host of new earth-to-satellite and satellite-to-earth 'bands'. Some will be earmarked for "direct to home broadcasting", others for general (common carrier) use. Most bets are that "direct to home broadcasting" will not be assigned for North America; at least not U.S.. Canada however wants it, is pushing for preliminary agreement now and then hopes to have final agreement at 1983 "regional" meeting. There is no consensus even within regions of world of where these up and down link bands will be after WARC finishes. Present C-band (3.7 to 4.2 GHz) seems unlikely spot however for any direct home broadcasting; some favor lower frequency assignments (some are suggesting spectrum in 2.5 GHz region) but most see direct broadcasting satellites in high-11 to 12 GHz region. Actual allocations for service are likely to be anti-climatic since major hurdle or approving **premise** seems to have been cleared. U.S. position and Canadian position differ widely leading to speculation that nothing may be settled in **North America** until after 1983 time frame (next regional meeting). If any question of major significance is to be resolved it will be finding home for **uplink bands** for direct to home broadcasting satellites. Apparently worldwide the terrestrial microwave allocations are such a hodge-podge there is nothing like a 'clear' or 'unused' or even 'lightly used' 500 MHz spectrum available universally. Likely prospect is that different uplink bands (probably between 10 and 15 GHz) will be used as fits the local terrestrial situation. WARC will drag on for several more weeks.

GLODOM (Global Domestic Satellite System) in proposal prepared for ITU does suggest international direct to home broadcasting system in C-band using 24 transponder birds with \$15,000 receive terminals (they apparently did not have a representative at SPTS!). They project 1982-3 launch cycle but because of opposition from present C-band users nobody expects proposal to fly. U.S.S.R., Europe, and U.S.A. would be **excluded** from coverage areas.

ANIK-B, the dual-band RCA Astro Division bird made operational last February at 109 degrees west is starting 'long term tests' of direct to home broadcasting in Canada; using 12/14 GHz six channel portion of bird. Downlinks involved are 11,700 to 11,780; 11,780 to 11,860 to 11,940 to 12,020 to 12,100 and 12,100 to 12,180 (each 80 MHz wide). S. E. D. (a Saskatchewan based Canadian manufacturer of TVRO gear) has produced 100 1.2 and 1.8 meter receive terminals; suggests 'quantity pricing' in \$500 region per terminal. To satisfy the political pressures in Canada, entertainment programming (from CBC service) will be heavy part of schedule. ANIK-B on 11/12 GHz downlink uses trio of 'spot beams' and with rapid 'falloff' beam is not likely to be 'useful' very far south into U.S.. Canadian authorities

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.

10139 Apache Road, Richmond, VA 23235
(804)320-4439

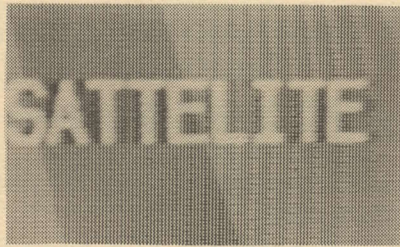
are openly admitting 'hundreds of private satellite TV terminals now exist in Canada' and hope appearance of ANIK-B 11/12 GHz tests will keep Canadian out-back viewers (1) happy, and, (2) discourage them from watching U.S. programming via SATCOM and WESTAR.

TORUS antenna - COMSAT has applied to FCC for permission to build and use antenna design called 'Torus'; a spherical-like antenna measuring 10 by 14 meters in size. Antenna, if approved by FCC will cost COMSAT 1.1 million per copy and will be installed at COMSAT gateway stations located Jamesburg, Ca., Andover, Me. and Etam, W. Va.. Torus is very much related to Oliver Swan's Spherical Antenna, operates on almost identical theory, can feed several birds at same time with offset feed horns. Only COMSAT could turn a 'duplicate for \$300 Swan Spherical' into a \$1,100,000 project!

BIRD talk. Canada has moved CTS-Hermes four channel 12 GHz experimental satellite around equator to west to give Australians something to play with. Aussies are getting poor deal however; bird has been on last legs of its experimental life for several months. Australians are three to five years away from having own bird. ATS-6, the original video rover, is dead. NASA shut it down and dropped it to 325 mile height to insure it does not get in the way of other birds in geostationary orbit. Bird ran out of fuel, was widely used over North America, India and during last operating months relayed television and data to American Samoa and Guam in 2.6 GHz band originally used for 1975 test over U.S.. RCA asking for permission to launch SATCOM IV to 83 degrees west and also asking for permission to build SATCOM V for on ground spare. Current plans for launch of SATCOM III November to early December continue to look good. COMSTAR IV meanwhile (ATT/GT&E satellite) is on spot; either must launch by 1981 or not at all. COMSAT's big bird is not compatible with Space Shuttle and worse yet not compatible with Delta launch vehicles. Only Atlas Centaur can lift bird into orbit and pad 36A which is Atlas launch pad is supposed to close by end of this year; in any case no later than early 1981.

TURNER's new 24 hour per day news service, meanwhile, is moving ahead. Heavy advertising indicates service is looking for engineers, producers, technicians and others **now**. Most recent press releases indicate Turner has passed 1.2 million home mark in pre-sign-ups. Turner had originally said the charge would be in 15 cent per home region until they got into 7.5 million homes, at which point service would be free to cable systems because advertising could support it. Turner has been saying in public start date would be mid-80 but if Washington-Post is on way with similar, competitive service, Turner's start date could well advance.

SPN programming on transponder 21 (that's an advertising, no charge service) is looking better every month. Recent addition has been VCI Movie Time in prime time weekend slots with fairly recent G and GP movie fare (advertising supported).



HBO was final choice of Holiday Inns. Presently being installed are around 75 terminals at first of Holiday owned and operated Inns. Only owned and operated Inns will have service for next six to nine months, eventually will spread out to franchised Inns. HBO service will be 'free' to Holiday customers and HBO says that over 100 million people per year use Holiday; HBO feels this will be good for their service expansion since millions will become familiar with HBO service for first time through Holiday Inn registration.

JAPANESE groups interested in direct to home satellite broadcasting in that country have formed broadcasting and telecommunications organization to plan the operation of the service in that country. Present BSE satellite is strictly experiment; next step will be dedicated satellite(s) for that service with satellite launch seen by 1982/1983. Whole program was approved by Japanese Diet in June.

INDONESIAN satellites Palapa I and II, currently being used for some relay of 'regional television programming' for neighboring Brunei and Phillipines, will be model for expanded 'regional domestic-plus' satellite system. Indonesia is planning Palapa-B that has characteristics of Canada's (RCA Astro produced) ANIK-B; operational on both C band and 12 GHz, for 1982/83 launch. They say they have agreement worked out with Thailand for use of B series bird(s) and expect to announce similar arrangement with Malaysia soon.

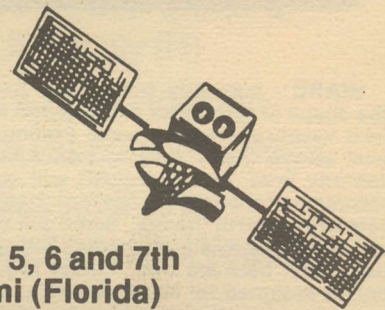
AUDIO via satellite services continue to grow but inspite of their numbers the service doesn't attract the interest of video. In most recent activities, MUZAK will install 400 audio receive only (ARO) terminals around the country. RKO radio is now using Western Union to distribute 3 minute hourly newscast to subscriber stations; sharing AP located ARO terminals. AP's first 3 meter terminal went into WGST in Atlanta; 37 total planned in initial 'test phase' of feeding "wire-service" news directly to station customers. (The next generation of radio new-jockies will have to learn to say "I have ripped the following off of the satellite..." rather than "I have just ripped the following off of the wire"!).

Western Union WESTAR seeks rate increase for voice circuits at FCC; would go up 5-7% to \$550 per month for a twenty four hour per day 4 kHz voice grade circuit between New York and Chicago or to \$4,950 per month for a 48 kHz wide full time channel.

SIN reported to be ready to turn on first translator fed via satellite; in Denver area. Numerous applications pending at FCC for satellite delivered services to be re-radiated in local area via 100 or 1,000 watt UHF translators.

Among many new satellite programmers announcing they will use FIII is Black Entertainment Network; a two hour or so per week offering (tentatively scheduled for C-SPAN and Madison Square Garden transponder 9) that will be commercially sponsored. Another service planning FIII debut will program 12 or more hours per day to geriatric trade; programming specifically for people over 50. Sort of Lawrence Welk times 12, seven days a week! Small or minority group television is bound to grow at rapid rate after FIII is active, much of it will be for a few hours per day or a few hours per week and the satellite will be the inter-connection system. That a hard core porno channel service has not surfaced is the wonder of where all of this is headed ...

SPTS 80 MIAMI



**FEBRUARY 5, 6 and 7th
at the Miami (Florida)
Bayfront Park Auditorium!**

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

SPTS '80 / MIAMI

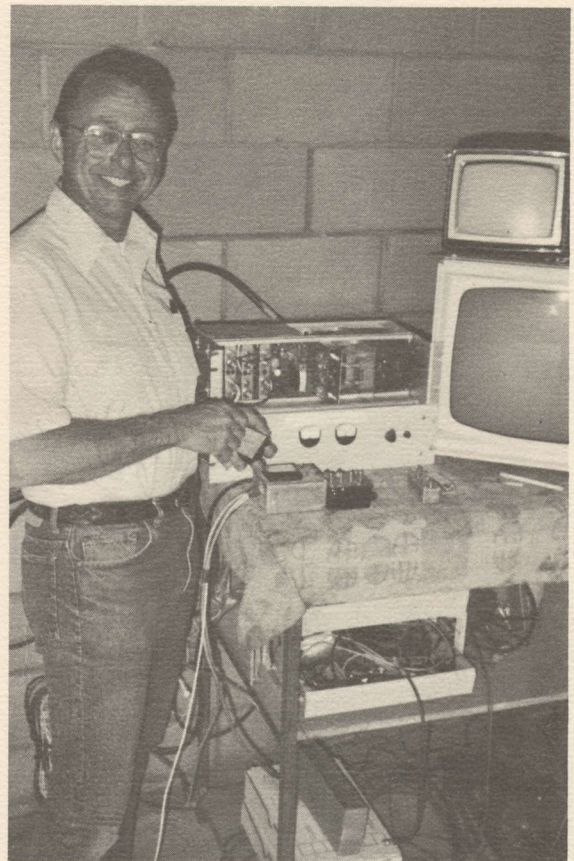
Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

INTRODUCING....



MR. CHEAP



MR. CLEAN

Robert M. Coleman of Travelers Rest, S.C. has been dubbed 'Mr. Cheap' because his approach to designing and building low-cost TVRO terminals is bottom line slanted. H. Taylor Howard of Stanford University, on the other hand, wants every electron in place and every cable harnessed. So we call him 'Mr. Clean'.

The Howard Terminal produces perfect pictures. Featuring a Howard designed and tested bi-polar LNA package, a Howard conceived fully frequency-agile 24 channel tuneable receiver (with selectable audio sub-carriers) the **HOWARD TERMINAL MANUAL** leads you gently from the reflector surface (which you provide) through the horn-feed (described by Howard) through the multi-stage LNA and then through a complete build-it-yourself professional grade receiver. Less the parabolic reflector, you can duplicate the Howard Terminal receiving package using state-of-the-art brand new parts for less than \$1,000.

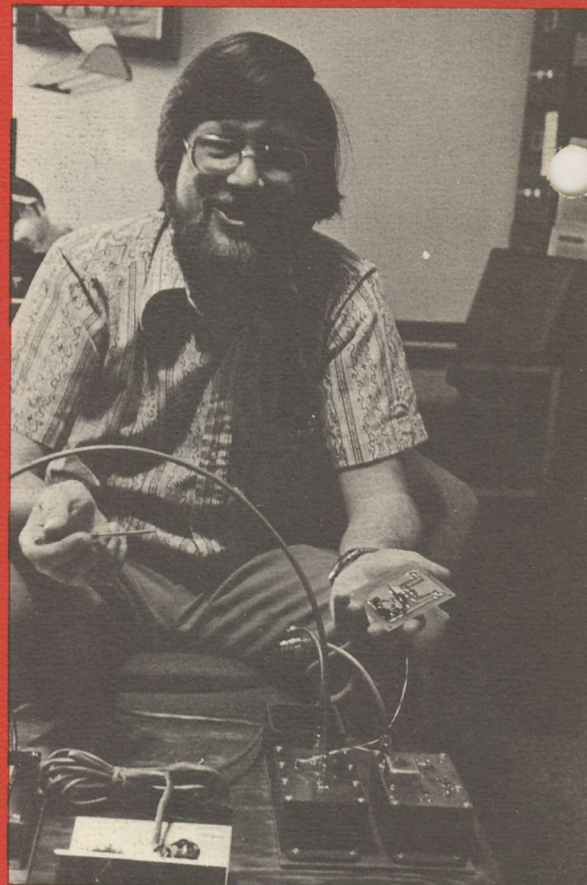
The Coleman Terminal produces high quality pictures; but not perfect. The original Coleman Terminal produced satellite television for around \$200 of Coleman's money. You start out with 'surplus' (as in used) equipment, modify it slightly, plug it all together and you are in the satellite TV reception business. The **COLEMAN TERMINAL MANUAL** shows you how, step by step, including constructing your ultra-low-noise GaAs-FET TVRO LNA! With 'the Coleman approach' you start off for small change and improve your system step by step as your desire and finances dictate.

The **HOWARD TERMINAL MANUAL** is priced at \$30 from STT. The **COLEMAN TERMINAL MANUAL** is also priced at \$30. **And** - you can have both manuals, together, as the perfect complimentary package of the 'cheap' and 'the clean' approaches to low cost satellite TV reception for the special STT package price of \$50 (in U.S. and Canada; outside add \$5 **per manual** for airmail service).

SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA, OK 73007 (405-396-2574)

SPEND 8 HOURS WITH H. PAUL SHUCH

YOU'LL BE SMARTER FOR THE EXPERIENCE



H. PAUL SHUCH will give you an important 'leg-up' on microwave and satellite TV technology. In eight lectures (originally conducted for SPTS '79) he takes you through TVRO (1) Antenna and LNA Selection, (2) Superheterodyne Down Conversion Techniques, (3) Modular Receiver Design Approach, (4) Scattering Parameters, (5) Analytic Amplifier Design, (6) TVRO Test Equipment and Procedures, (7) Baseband Processing Systems, and, (8) TVRO System Summary. This eight-lecture series is the perfect learning tool for teaching yourself, your class or your employees all about the basics of satellite TV reception techniques!

The Shuch Satellite Symposium videotape series is available on VHS (LP) or BETA (BETA-2) format videotapes in a learning package. Paul Shuch is a frequent contributor to many microwave publications including the Proceedings of the IEEE. This eight-lecture series was videotaped live before the SPTS '79 overflow crowd in Oklahoma City this past August. Paul has an easy going, down-to-earth manner to carefully guide even the most inexperienced microwave hand through the complexities of microwave based satellite TV reception system design. There is no finer, or easier method of learning what you and your people need to know about the world of microwave TV reception. Order your special SHUCH SATELLITE SYMPOSIUM set of videotapes today.

SEND US THE LECTURE SERIES ON VHS (LP) color videotape. Our check for \$210 is enclosed (add \$10 in Canada, Mexico; \$25 elsewhere).

SEND US THE 8 LECTURE SERIES ON BETA (BETA-2) color videotape. Our check for \$225 is enclosed (add \$10 in Canada, Mexico; \$25 elsewhere).

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